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PACKING FOR DOMESTIC and EXPORT SHIPPING

I. Economic Side of the Problem

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This article is the first of a series dealing with the all-important factor of packing goods for shipment. There is nothing more annoying to a customer than to have a machine part, for example, for which he has been anxiously waiting in order to get his production in full swing, arrive in a useless condition because it was improperly packed. Usually, he proves the fallacy of such economy by ceasing to be a customer of that particular merchant or manufacturer. This subject is of vital importance just now when we have a golden opportunity to secure our share of world trade, and every exporter should study it.

PACKING as applied to shipping may be defined as the putting up of goods in the form of a package for transportation. The package may be a box, crate, carton, bale, bundle, barrel, drum, sack, bag, roll or some other form.

The purpose of packing is two-fold; to protect the goods during shipment, and to afford a means whereby they may be easily and economically handled during transportation and storage. The protection of the goods from damage is as a rule the most important factor, although, in the case of some commodities which are small or of irregular shape, the container or wrapping material, aside from the factor of protection, is indispensable as the only means of affording economical shipment and storage.

The vital considerations in packing goods for shipment are, in the order of their importance:

1. Adequate protection from damage during shipment.
2. Maximum saving of shipping space and gross weight.
3. Minimum cost in packing, handling and delivering at ultimate destination.

Adequate protection from damage is necessarily the most important consideration because if the goods are injured during transportation the principal purpose of packing is defeated, and the time, labor and money spent in packing are wasted. Lack of knowledge of what "adequate protection" constitutes in each case is one of the primary causes of inadequate packing as will be discussed later.

Maximum saving in shipping space and gross weight are of great importance because it is upon either the space occupied by the package or its gross weight that freight charges are based. As freight charges are an expense which must always be added to the price of a commodity to get the delivered price, any saving in freight will be reflected in the delivered price of the goods to the shipper's advantage. Reducing the displacement and weight of packages also saves storage charges, and import duty, in the case of export shipment to those countries where duty is levied on the gross weight of the package.

Minimum cost of packing, handling and delivering is of vital importance, since the total cost of delivery at the ultimate destination affects the delivered price to the customer. A very slight differential in packing and delivery costs is often the determining factor in whether or not one manufacturer's product can compete with another's product in a certain market. In reducing packing costs to a minimum, however, it is a matter of the greatest importance that the quality of the packing should not be lowered to the point where it is inadequate and does not afford sufficient protection to the shipment.

In the past, as a rule, packages have been constructed according to the ideas of the firm or individual who was packing the goods. The interpretation of the Railroad Classification Rule demanding that "all containers must be strongly made from material of sufficient strength to protect the article against the ordinary risks of transportation" has been left to the packer. He has been compelled to judge for himself (except in the case of a few commodities where the construction of the package

is specified) just how well his product should be packed to withstand the ordinary hazards of shipment. This condition is undoubtedly one of the principal causes of inadequate packing in domestic as well as export shipment.

It is only in the last few years that the problem of packing has been scientifically studied and that some of the fundamental underlying principles of package construction have been arrived at. In a few instances these principles have been applied to standard commercial packages with very gratifying results, such as in the case of wooden boxes for canned foods of which over 100,000,000 are used annually. The best example, however, of what may be accomplished by the application of scientific principles in packing is had in the experience of the United States Government during the World War. In packing army supplies for shipment to the troops overseas, savings in ship, car and storage space and savings in costs of packing amounting to many millions of dollars were effected by standardizing packing specifications. In the case of army clothing alone $50,000,000 was saved in cargo space by packing in bales in place of boxes. Numerous savings were also made in packing gun carriages, motor equipment, shells and many other kinds of material. (An article appearing on page 114, Vol. 51, of the *American Machinist*, explains in detail the methods of packing army supplies for shipment overseas.)

The importance of proper packing in both domestic and foreign trade is gradually coming to be realized. One of the best proofs of this is the fact that a number of the largest concerns in the country recently detailed their packing officials to the United States Forest Products Laboratory at Madison, Wisconsin, for a study of the fundamental principles of package design. Also one large electrical manufacturing company recently broke up $4,000 worth of incandescent lamps in testing lamp containers to determine the most efficient type of package.

Good Versus Bad Packing

Good packing not only prevents merchandise from damage during shipment and storage but it is also an advertisement. It shows a consideration for the buyer, an effort to have the goods reach him in as good condition as they left the factory.

Bad packing generally results in damaged goods with consequent loss of money and delay and inconvenience to the buyer in repairing or replacing the merchandise. It also creates a bad name for the guilty concern and places it at a decided disadvantage with competitive firms who understand how to pack properly.

In export trade especially is good packing of great importance. In the case of trade with one foreign country it has even been said that "competition is almost reduced to a basis of good packing rather than competitive merit or superiority of the articles themselves." Our foreign competitors have made a careful study of the special requirements of various countries and as a rule are very careful about their packing. We, on the other hand, have been wont to see how much we could cheapen our packing and still have it suffice. As a rule foreign buyers would rather pay for special packing than have their merchandise damaged during shipment because of cheap, poorly made containers.

One of the best examples of what may be expected to happen to goods which are improperly packed for export shipment is given in a report (Commerce Report No. 85, Bureau of Foreign and Domestic Commerce) from Consul General W. L. Lowrie, Lisbon, Portugal, dated Feb. 12, 1919. The very valuable lesson in this report justifies quoting it here completely:

So much has been written and said about insecure and inefficient packing that it has become an ancient complaint, but a Lloyds' report on a cargo which recently arrived at Lisbon, valued at nearly $5,000,000, may be of interest and value. It is as follows:

"Lisbon, Jan. 25, 1919.—As requested, I proceeded on board the vessel on Thursday and also today for the purpose of examining cargo which was alleged to be in a damaged condition, the vessel having arrived with general cargo for this port and lying moored alongside the quay at Entreposto de Santos. Arriving on board I noted lying about in No. 4 hold a large quantity of small pressed brass and nickel cups presumably for cartridge bases, and found that these had been packed loose in boxes which were broken principally because they were not strong enough or sufficiently secured. They appeared to have been stored a considerable time, for the wood had shrunk and had thus reduced the grip of the nails, a condition conducive to breakage under the usual strain of the loading, stowing and discharging of cargo. It would have been better also had the cases had an inner lining of some strong material to prevent the escape of the small articles when the wood was broken.

"Tin-plate boxes of the larger size were almost all broken insomuch that it was necessary to stack a quantity in bulk in the warehouse, and I noted that a number of the smaller sizes were also broken. I am of the opinion that this material is not packed in sufficiently strong boxes. Copper sheets were packed loose in skeleton cases which in some instances were badly damaged, and since the sheets were not banded together before being placed in the cases, they will escape as soon as one side of the box gives way and be more or less damaged.

"Thin sheet iron was in bundles, but the corners were knocked up and many sheets were bent. One case of long copper tubes was completely destroyed, and many tubes were injured and bent. Sundry other cases of skins, soap, tools, etc., were also damaged, sides being staved in. Here again the wood appeared to be dry and brittle. Cases were discharged from holds in this condition because the damage was not reasonably due to the unloading at this end.

"Tobacco in hogsheads was examined in the hold before

removal was attempted. The hogsheads were already broken in the majority of instances, staves being loose and ends being out.

"Generally speaking, there is nothing unusual in the methods employed in unloading the cargo. I was informed that the vessel had had a good average passage, and I am therefore forced to the conclusion that some damage to the cargo was caused before or during the loading, was augmented by the weight of the cases being stored one above the other in the vessel, and was in many instances unavoidably increased during the discharging here."

Certainly, the application of a few of the fundamental principles of package design would have been beneficial in this instance and the slight extra cost of good containers would have been only a fraction of the money loss in damaged goods.

At the present time American export packing is of vital importance. We are looking forward to greatly increasing our export trade. We have our eyes on foreign markets where trade competition with other countries will be keen. We cannot expect to expand our trade in these markets or to wrest markets from foreign competition if we deliver our goods in a damaged condition while our foreign competitors take special pains to deliver their product in perfect shape. Many a foreign market for American goods has in the past been lost because of poor packing and many a market will be lost in the future if we do not pay more attention to this important matter.

TABLE I. FREIGHT REVENUES AND CLAIMS PAID*

Fiscal Year Ending June 30	Freight Revenue	Claims Paid	Per Cent
1906	$1,640,386,655	$21,086,219	1.29
1907	1,823,651,998	25,796,083	1.41
1908	1,655,419,108	27,554,526	1.66
1909	1,677,614,678	24,916,380	1.49
1910	1,925,553,036	21,941,232	1.14
1911	1,856,504,287	24,209,081	1.30
1912	1,897,692,838	24,593,806	1.30
1913	2,140,083,394	30,516,929	1.43
1914	2,059,891,935	33,379,057	1.62
1915	1,977,933,275	29,528,016	1.49
1916	2,402,210,995	27,738,893	0.95
1916e	2,543,599,117	23,209,639	0.91

eEnding December 31.
*Interstate Commerce Commission Docket No. 10048.

The Loss-and-Damage Problem in the United States

The payments by the railroads of the United States for loss-and-damage claims have been a heavy drain upon their revenues for many years, averaging for an eleven-year period from 1906 to 1916, around $26,000,000 per annum. Table I shows a comparison of freight-claim payments and freight revenues during this period.

Table II is a summary by commodity and Table III a summary by cause of loss-and-damage of the total freight-claim payments made during the calendar year 1914 by all the steam railroads with annual revenues exceeding $1,000,000 each. These two tables are worthy of very careful study as they shed a good deal of light upon the loss-and-damage problem.

Although the causes of loss-and-damage claims given in Table III do not include separately the claims due to inadequate and improper packing, nevertheless the claims due to this cause are included in a number of the other causes as listed. The most important classified causes in Table III where inadequate and improper packing probably enter are as follows: Robbery, other (improperly made packages are easy to get into and encourage pilfering); unlocated loss of entire package, and unlocated loss, other (improper packing and improper marking are both factors which contribute heavily to the loss of packages); rough handling of cars (inadequately constructed packages are subject to damage in the shifting of the contents of a freight car during rough handling of the car); improper handling, loading, etc. (inadequately constructed packages are subject to damage during improper handling and loading).

TABLE II. LOSS-AND-DAMAGE CLAIMS CLASSIFIED BY COMMODITIES*

Commodities	Amount	Per Cent
Boots and shoes	$912,420.63	2.818
Clothing, dry goods and notions	2,194,096.03	6.777
Butter and cheese	323,561.87	0.999
Eggs	686,347.27	2.120
Fresh fruit and vegetables	2,687,393.36	8.300
Live stock	2,211,655.92	6.831
Meat and packing-house products	1,031,633.61	3.186
Poultry, game and fish	248,446.98	0.767
Grains	2,718,077.58	8.395
Flour and other mill products	1,394,578.04	4.308
Sugar	405,559.88	1.253
Groceries	1,434,687.68	4.431
Wines, liquors and beers	740,832.78	2.288
Tobacco and tobacco products	613,538.23	1.895
Cotton	404,214.05	1.249
Furniture, new	1,626,330.70	5.023
Household goods	1,011,605.76	3.125
Products of cement, clay and stone	903,881.95	2.792
Glass and glassware	698,614.60	2.161
Stoves	516,895.74	1.597
Iron and steel castings and bars	676,499.42	2.089
Vehicles	492,377.48	1.521
Agricultural implements	256,235.55	0.791
All other commodities	8,186,132.44	25.284
Total	$32,375,617.55	100.000

*Interstate Commerce Commission Docket No. 10048.

The responsibility for damaged packages both in domestic and export shipment has always been a much argued question. The shipper is generally inclined to place the blame on the carrier and say that the damage was due to unnecessary rough handling. The carrier on the other hand is inclined to pass the blame back to the shipper and say that it was due to improper packing. There are undoubtedly many instances when each is right in his turn. However, it is a very difficult thing to draw a hard and fast line between unnecessary rough handling and the more or less rough treatment which a package is bound to receive at congested freight yards, terminals and ports where freight must be handled quickly and where individual attention cannot be given each package or shipment. Regardless of where the responsibility for the damage lies there can be no doubt that in many instances the loss-and-damage question would be entirely eliminated by better and more secure packing.

TABLE III. LOSS-AND-DAMAGE CLAIMS FOR 1914*

Causes	Amount	Per Cent
Robbery of entire package	$659,159.52	2.036
Robbery, other	1,284,250.67	3.966
Concealed loss	688,879.71	2.128
Unlocated loss of entire package	5,156,318.94	15.926
Unlocated loss, other	2,522,271.57	7.790
Fire	790,250.46	2.444
Wrecks	2,096,673.25	6.476
Concealed damage	914,518.10	2.825
Defective equipment	3,506,545.95	10.830
Errors of employees	1,019,136.10	3.148
Rough handling of cars	4,343,481.76	13.415
Improper refrigeration and ventilation	1,035,685.50	3.199
Improper handling, loading, etc.	1,346,061.95	4.157
Delays	2,187,345.17	6.756
Unlocated damage	6,767,634.95	20.903
Forfeitures under penalty statutes	12,561.12	0.040
Total	$32,375,617.55	100.000

*Interstate Commerce Commission Docket No. 10048.

The fact that the railroads of the United States are paying out yearly millions of dollars in damage claims and that improper packing is one of the important

sources of these claims emphasizes the need of the standardization of packing wherever possible. The payment of this enormous loss and damage bill means not only a substantial loss in freight revenue but also a great economic loss of labor, merchandise and materials which might in many instances be saved for the consumption of the nation. Some loss and damage of packages is undoubtedly inevitable in railroad or any other method of transportation, but on the other hand loss and damage due to improper packing is largely within the control of both the shipper and the carrier.

As before stated, the present Railroad Classification Rules leave too much to the interpretation of the packer or shipper. They are so broad and so indefinite that they are susceptible to many different interpretations and this makes their enforcement difficult and in many cases impossible. The adoption and enforcement by the carriers of definite specifications for containers—specifications capable of only one interpretation—will be the solution of that part of the loss-and-damage problem due to inadequate packing.

During the past year a new era has dawned in packing. The two common carriers, the United States Railroad Administration and the American Railway Express Co., have taken steps to improve present packing methods and reduce their loss and damage bill. The placing of these two carriers under Governmental control has made it possible to begin the standardization of specifications and the adoption of standard containers. This would have been very difficult if not impossible under private control owing to competition between the different roads or companies. The Railroad Administration has already adopted standard containers and standard methods of loading some commodities and is at work on other standardization. The American Railway Express Co. has conducted a nation-wide educational "Pack Right, Mark Right" campaign and has adopted new express packing rules, setting forth standard packing methods which will be put into effect in the near future.

The adoption of these new standard packing specifications undoubtedly represents the most important packing reform that has yet taken place and it is hoped that in the future the administration of the carriers will be such that this work of standardization can be carried on to completion.

Compression-Spring Testing Machine

By J. V. Hunter

Springs are frequently specified to sustain a certain weight when compressed to a stated length, and the requirements in this respect are very exacting for the springs used in ordnance work. The labor entailed in the testing of the large number of springs used in the breech mechanism of the 4.7-in. gun led to the design of a special spring-testing apparatus for use in the shop of the Northwestern Ordnance Co., Madison, Wis.

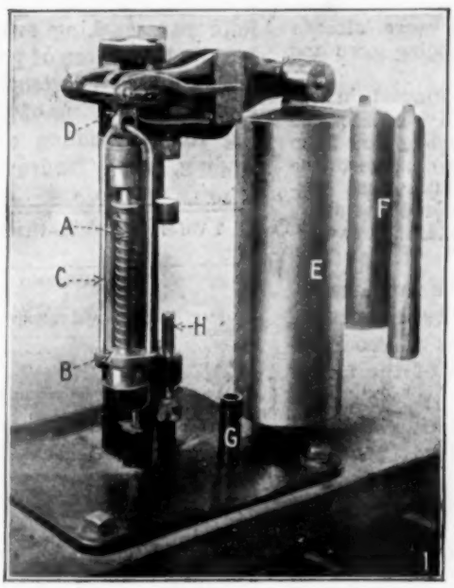


FIG. 1. TESTING MACHINE BEFORE COMPRESSION OF SPRING

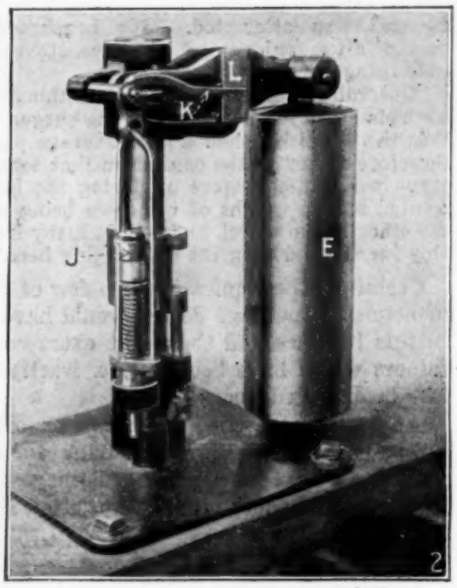


FIG. 2. MACHINE WITH SPRING IN COMPRESSED CONDITION

The testing device is shown with the compression spring in an unstressed condition in Fig. 1. The spring is slipped on a small arbor *A* which prevents it from springing out of line between the upper and lower bearing points. Its lower bearing *B* is carried by a stirrup *C* hanging from the equal arm level *D* which is counterbalanced on its outer end by the weight *E*. Some of the different weights provided to meet separate spring specifications may be seen standing in the rear at *F*. The specified length of the compressed spring is equal to the length of the gage bushing *G*. This is placed over the end of the screw *H* and the latter is raised until its end is flush with the top of the bushing.

A foot lever underneath the bench pulls a rod which draws down on the casting *J* and the upper bearing of the spring, compressing it as shown in Fig. 2. When thus compressed the spring, if within the limit, will balance and raise the weight *E*, and the pointer *K* will remain practically stationary at zero on the scale *L*. A spring too weak or too strong will throw the pointer beyond certain specified limits above or below the zero mark. The apparatus may be very quickly operated, and reduces the time of testing very materially from that required by the older methods.

Holding Slip Bushings

By A. W. Freeman

On page 1002, Vol. 51 of the *American Machinist*, Henry Bowman describes a method of holding slip bushings with a capscrew. I like this method for some kinds of jigs but I think Mr. Bowman failed to catch the point I tried to bring out in my article and sketch on page 336 of the same volume.

It would be impossible to use the capscrew method, as shown by Mr. Bowman, in a box jig where it is necessary to drill from opposite sides, as the screw head projecting above the surface of the jig would prevent the jig from laying flat on its surfaces when drilling from opposite sides.

The "Helmet" Safety Pins and the Machines for Making Them

BY S. A. HAND
Associate Editor, *American Machinist*

The wire part of the "Helmet" safety pin is made in an automatic machine that is almost human in its action. This machine takes the wire from a coil, straightens it, cuts it to length, sharpens the point, coils it and finally assembles it to the head. Both this machine and the one for blanking and drawing the head are illustrated and described in this article, in which is also given a description of the manufacture of a two-piece safety pin.

THE annual production of safety pins in the United States is approximately 15,000,000 gross, of which a substantial percentage is made at the plant of the Consolidated Safety Pin Co., Bloomfield, N. J., to whom we are indebted for the opportunity to present this article to our readers.

Fig. 1 illustrates the parts of the "Helmet" safety pin in which *A* is the punched blank for the head; *B* is the head as folded or drawn; *C* is the wire for the pin as straightened, cut off and pointed; *D* is the pin coiled and bent, while *E* is the completed pin. *F* is an enlarged view of the point to show its shape.

BLANKING AND DRAWING THE HEAD

The heads are blanked and folded or drawn in one stroke of the double-acting punching machine, Fig. 2. As will be seen in the illustration, three strips of brass are simultaneously fed to the machine from the spools *A* through lubricating compound in the tank *B*, where they are submerged by the rolls *C*. The drawing punches may be seen at *D* protruding through the blanking punches *E*. Each set of punches is operated by separate eccentrics so timed that the drawing punches do not descend until after the blanking punches have completed their work. When blanked from the strip the pieces drop through the dies, and into nesting plates where the drawing punches reach them and force them through the drawing dies below. No blank holders are used and the operation is more one of folding and ironing than it is of drawing, as the spaces between the punches and dies are just enough less than the thickness of the metal worked to accomplish the smoothing out of any wrinkles that may form in folding. By referring to the points *a* in *A* and *B*, Fig. 1, the amount the metal that has been drawn can be seen.

DISPOSITION OF SCRAP

As the scrap left from blanking would amount to a considerable bulk, provision has been made for cutting it into small pieces by a shearing attachment at the back of the machine, as may be seen in Fig. 3 at *A*. This shear receives its motion from the ram of the machine and

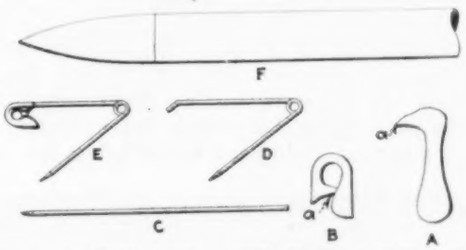


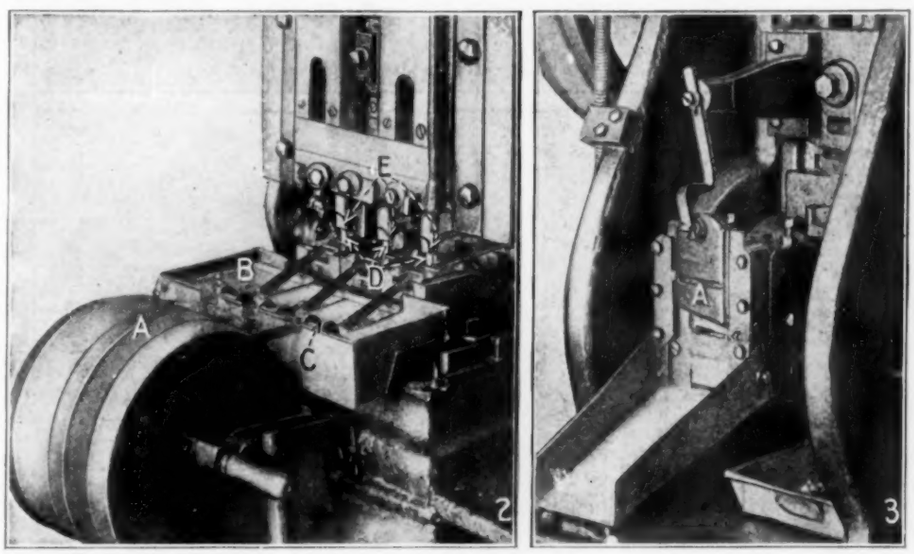
FIG. 1. DETAILS OF A "HELMET" SAFETY PIN

cuts a piece of the scrap equal in length to the amount fed for blanking, reducing the scrap to short pieces that can be compactly stowed. The machines make 120 or more cuts per minute, according to the size of the work.

DIPPING AND TUMBLING

The heads are next dipped in a hot solution to clean them from dirt and grease and are tumbled for several hours in sawdust mixed with an abrasive to remove the sharp edges and burrs. The tumbling barrels are made of brass, for if made of iron or steel the work would be discolored.

The pins are automatically made by the machine illustrated in Fig. 4, which is a rear view. This machine takes the wire from a coil, straightens it, cuts it into pin lengths, sharpens the points, coils, bends, assembles them into the heads and fastens them in position. Further details of this machine may be seen in Figs. 5 to 9, and where reference letters are given the same letters refer to the same parts in all the views.



FIGS. 2 AND 3. MACHINE FOR PUNCHING THE HEADS

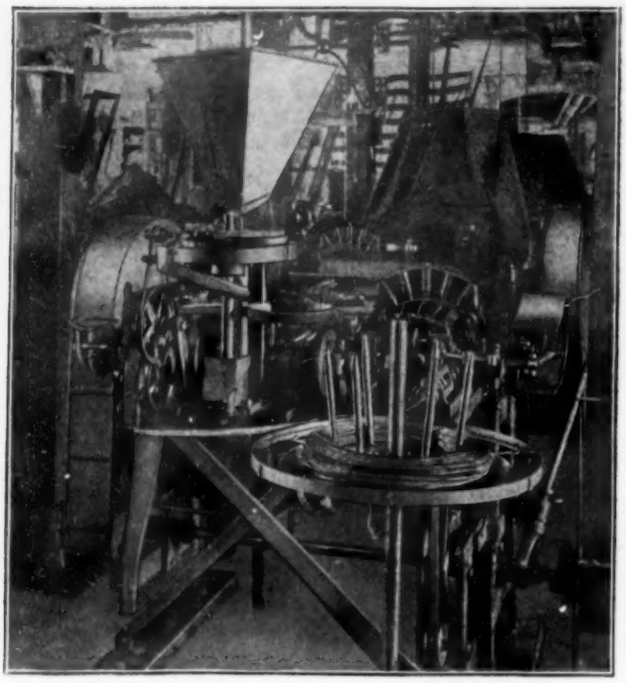


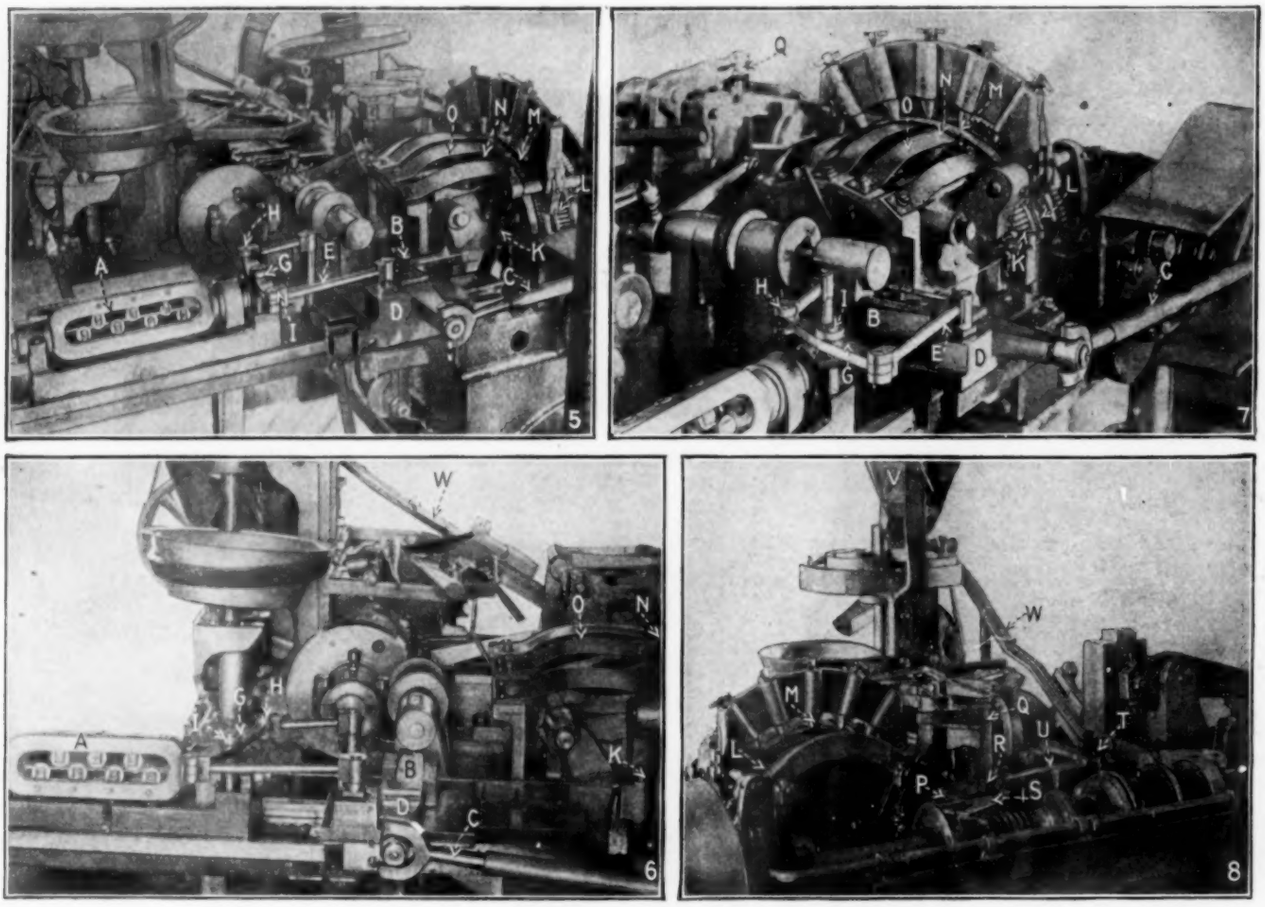
FIG. 4. AUTOMATIC MACHINE FOR MAKING SAFETY PINS (REAR VIEW)

The wire is fed from a coil at the rear of the machine, through the straightener *A*, which is of the usual rotating type and needs no further description. However, as the feeding of the wire is intermittent, inasmuch as it must be stationary while being cut off, it must never be at rest in relation to the straightening rolls or it would be kinked and broken in an instant. Both the straightener *A* and the gripper *B* receive longitudinal motion from an eccentric through the rod *C*, which is attached to the carriage *D*, the straightener being connected to the carriage by the rod *E* through the lever *G*. As the fulcrum of this lever is at *H* and its connection to the straightener at *I*, it is evident that the straightener will only travel half as far and at half the speed of the carriage. In operation the straightener moves forward with the wire, but at half its speed, and is moving backward when the wire is stationary for the cutting off operation. Thus at all times either the wire is moving through the straightening rolls or the rolls are moving over the wire.

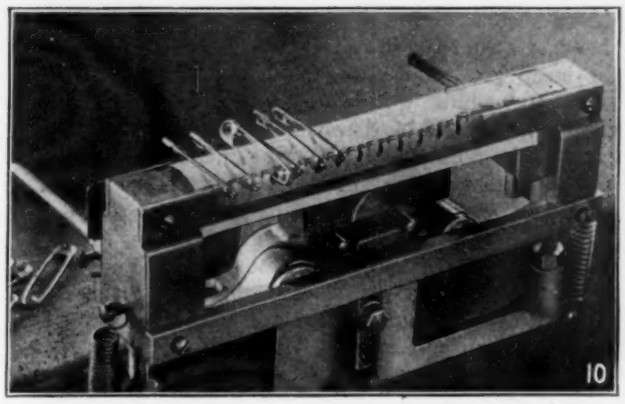
Cutting Off and Sharpening the Wire

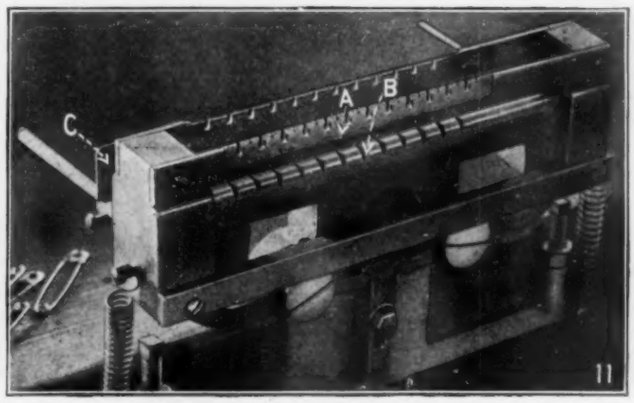
The wire is cut off at *K* and carried laterally to the revolving drum *L* which is composed of two series of disks, one series being cut similar to a gear while the other is plain and of a diameter about equal to the pitch diameter of the one that is cut. The wires enter the drum between the teeth of one set of disks and rest on the periphery of the plain set.

As the two sets of disks revolve in the same direction and one set at twice the speed of the other, it will be seen that as the wires are carried under and in contact with the spring-actuated pads *M*, rolling motion must take place. As the wires revolve they are carried forward with their ends beneath five files *N* attached under the ends of flat springs *O*. These files are set at slightly different angles and make short cutting strokes at the



FIGS. 5 TO 8. AUTOMATIC MACHINE FOR MAKING SAFETY PINS (DETAIL VIEWS)





FIGS. 10 AND 11. THE CARDING BLOCK
Fig. 10—The carding block in use. Fig. 11—The carding block empty.

rate of 3000 to 4000 per minute. The purpose of these files is to sharpen the points of the wires, and the reason for setting them at slightly different angles is so that the points will have a somewhat rounding contour rather than one of a regular taper.

Coiling and Bending

From the sharpening unit the wires are carried by a pair of worm conveyors *P* to a table and from there to a second carrying device, by which they are delivered to a mechanism *Q*, where each wire is in turn gripped by a pair of jaws while two operations—coiling and bending—are simultaneously performed. The coil in the center of the pin is formed at *R* and the bend that enters the head is made at *S*. After these operations, the wires, or pins, as they should now be called, are carried to the head-attaching device *T* by the swinging gripper *U*.

In the meantime the heads, having been placed in the hopper *V*, are being automatically selected by a revolving disk and turned with the opening for the pin in the right direction by friction against stationary cam-shaped guides placed close to the disk. From here they are started down the inclined magazine *W*, where they reach the attaching device *T* at the same time as the pins. At this point the bent end of the pin is inserted in the head and the whole, as a unit, fed between a pair of squeezing tools which indent the head in such a way as to firmly fasten it to the pin. From this point the pins are ejected and fall into a receptacle beneath the machine. The production of this machine is 80 to 90 pins a minute.

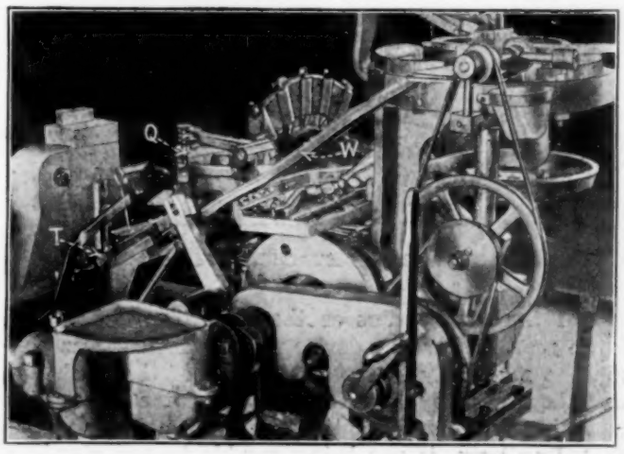


FIG. 9. DETAILS OF AUTOMATIC MACHINE FOR MAKING SAFETY PINS

After assembling, the pins are either brightened by dipping in acid, japanned, or electro-plated, according to the finish desired.

In plating, the pins are put in wire cages that are revolved while submerged in the plating solution, one electrical connection being made through one of the trunnions by a contact spring to which one of the wires from the generator is attached, and the other through the anode.

Preparing for Shipment

Before the pins can be packed in boxes they must be attached to cards. This is entirely a hand operation, which at first seems surprising when all other operations are performed on automatic machines. However, it was explained that the carding operation also included the inspection of the points and that this was a matter of feeling the pressure required to stick the pins through the card.

The carding block is shown in Figs. 10 and 11. In Fig. 10 the card is in place and has several pins stuck through it. Fig. 11 shows the block empty and ready for placing a card, which is done by slipping it under the guide rails *A*, far enough for the edge to come into contact with the adjustable gage *C*. By depressing a treadle the plunger *B* is raised, bringing the center of the card in a bulging shape above the guide rails. The pins are then stuck through the card, using the notches in the guide rails as spacing guides, and are closed or latched with one motion of the hand. An expert girl can card over 150 gross of pins per day.

A Shock Absorber for Intermittent Gears

By Frank Erwin

There have appeared lately in the *American Machinist* several articles on intermittent gears in which I have been much interested. None of them, however, touched on one phase of the subject with which the writer has had some experience, namely, the elimination of shock in starting and stopping heavy moving parts where the driven gear is smaller than the driver and revolves at considerable speed.

We had to deal with a number of such drives on heavy wire-fabricating machines. The drive consisted of a 20-in. mutilated gear driving an 8-in. pinion which made two turns to one of the driver, the latter turning 60 times per minute. The pinion was held during the idle period by a shoe which closely fitted the curved lug *D*, Fig. 1, cast on the side of the large gear. The

gears had a 2-in. face and the pinion drove two short trains of gears and wrapping spools through a $1\frac{7}{16}$-in. shaft 10 ft. long. It is apparent that the shock of starting and stopping all this was terrific. The cost of breakage was a considerable item and caused much delay for repairs as well as greatly limiting the speed of the machines.

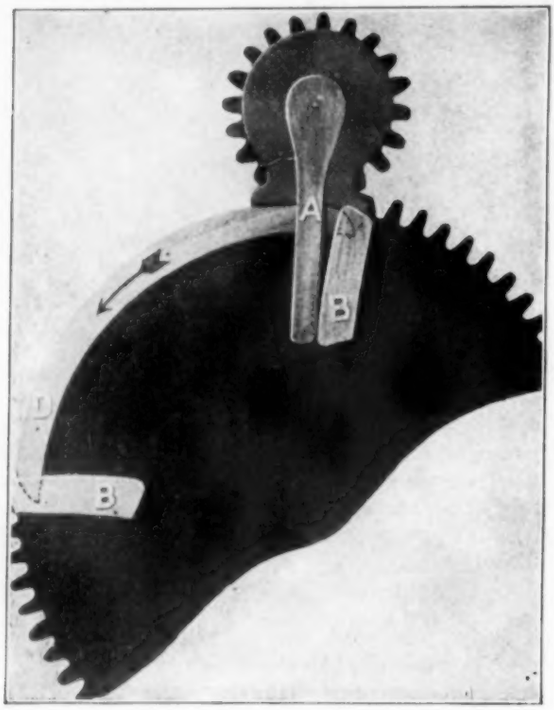


FIG. 1. SHOWING THE SLOW START

Various brakes, cushions, etc., were tried but usually only made matters worse. The device which finally proved successful was designed by the writer and consisted of steel lugs *B* at the ends of the blank space of the large gear and a finger *A* attached to the pinion extending radially well in toward the center of the large gear as illustrated by the model.

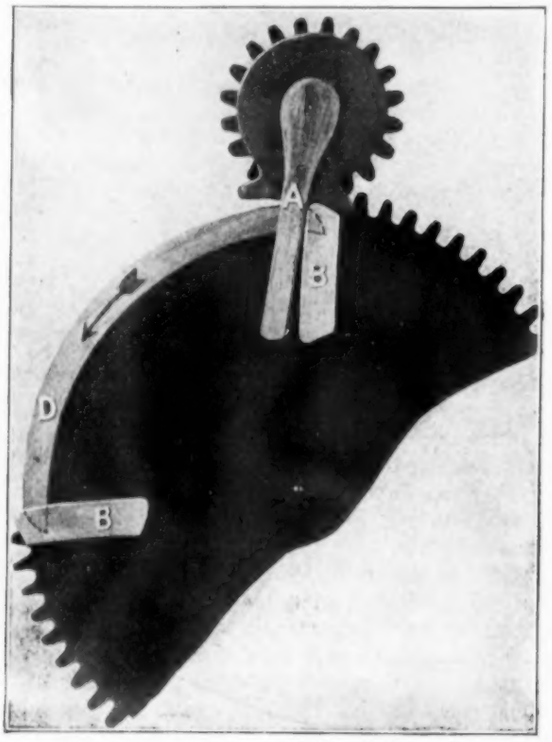


FIG. 2. THE ACCELERATION OF THE MOVEMENT

It will be seen that this arrangement greatly reduces the speed in starting the pinion, by the first point of contact being near the center of the driver and having a relatively slow motion and also by starting the pinion by the end of the long lever, thus for the moment reversing in effect the proportions of the pinion and gear.

In action the point of contact is first at *B*, Fig. 1, where the motion is the slowest, and as the driver advances, travels toward the periphery of the large gear; the motion imparted to the pinion is accelerated until the point *A* is reached as in Fig. 2, when the peripheral speed of both gears is the same and the teeth engage without shock or noise.

Order Reversed in Stopping

In stopping the pinion the order is reversed, the contact being first at *A*, Fig. 3, and moving toward *B*, thus gradually slowing the pinion down until the shoe rests on the flange *D*. Fig. 3 shows the gears just as the pinion comes to rest at the end of its period of revolution.

It was found best to make the sides of the lever attached to the pinion parallel, and the faces of the lugs *BB* of the same radius as the pitch diameter of the large gear. After this device was installed it was possible to materially increase the speed of the machines, and the breakage was reduced to about the same point as with gears running continuously. The noise was eliminated entirely, it not being audible to one standing right beside the machine.

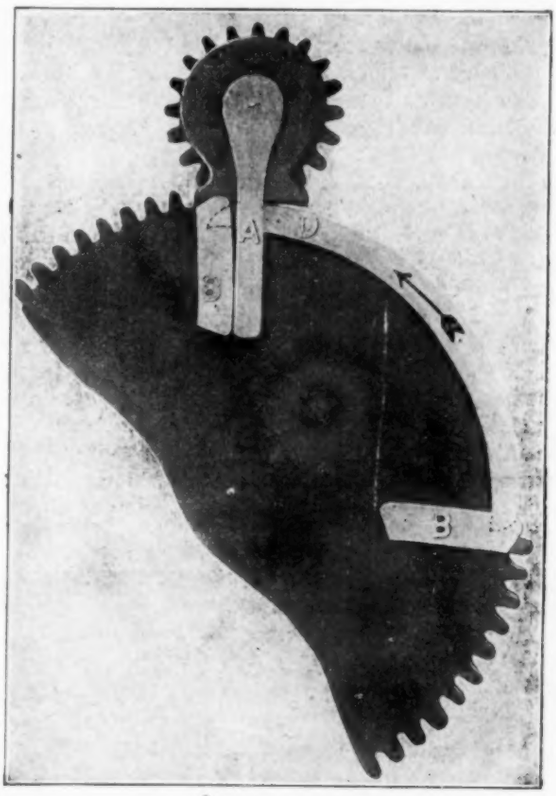


FIG. 3. THE SLOW DOWN AT THE CLOSE OF THE CYCLE

Wage Payment

By

A. L. DeLeeuw

UNREST among the laboring classes has taken on such proportions and is so widespread that it is timely to discuss the various items which enter into the present relations between employer and employee, even if no prescription for a cure can be given at the present time.

The present strife has a number of angles, of which one or more present themselves in individual cases. Quite often an honest attempt is made to reconcile the varying viewpoints of employer and employee, but more often it is purely and simply a question of war, of brute force; and a peace of victory, not of understanding.

It is well recognized that where two parties have a difference of opinion the first step should be to find some common ground from which to start, and that then the second step should be to define clearly and precisely the chief terms which enter into the controversy. It is never difficult to find the common ground between employer and employee.

One reason why discussions so often fail to bring the desired results and why they are often not started at all is that there is no clear understanding of some of the most commonly used terms in these controversies. The writer wishes to call attention to some of these terms, and to some of the misunderstandings in regard to their meaning.

We read practically every day about war between "capital" and "labor," about the demand of the laboring man for the "right to organize," and of his right to insist on "collective bargaining," and yet these three terms, which are perhaps used in every controversy that comes up, are not only not defined but they are actually misleading in themselves.

War Between Capital and Labor

If war between capital and labor means anything at all, it must mean war between capitalists and laboring men. *Capital is the result of past labor used progressively. Without capital, civilization is unthinkable.* Capital is the tool with which the laboring man works. There can no more be war between labor and capital than between the laboring man and his tools. It may be said that this is merely a fine distinction and not a difference, but the writer cannot take this view. Recent events in Russia have shown that there are a large number of people who actually believe and act upon the idea that capital must be destroyed in order to give the laboring man his own. It may be that the leaders who presented this thought did not have capital in mind, but were either referring to capitalists or to the present system of control of capital. But their slipshod way of expressing themselves, or the lack of existing definition, causes a large number of people to think that *capital itself* is at fault.

In late years the control of capital has been more and more centralized, or, in other words, in the hands of fewer individuals. And though it is well recognized that this condition has its advantages in many ways, yet the dangers to which such centralized control may well lead have caused it to be regarded with suspicion and enmity. Capital being the tool with which labor must work, it is but natural that labor should look with suspicion on an attempt to corner the tool supply. For this reason we may naturally expect that labor will insist upon a better control of its tools—capital. It cannot have war with capital, and there is no reason why it should make war against capitalists in general, for it need not be pointed out that many capitalists are good and honorable men who do not deserve the enmity of any one. On the other hand, it may well be conceded that labor has cause to dislike, or even hate, the present system of control of capital.

It has been pointed out many times quite recently that there are really three parties, not considering the general public, which have a right to be heard in this controversy, namely: capital, labor and management. It seems to the author that this merely leads to complication without any compensating features. Management and labor are both labor, but of different kinds. If at times they clash it is not due to unavoidable conditions but merely to defects in one or the other.

The Right to Organize

Another term which should be quite familiar to all of us by this time is the "right to organize."

The writer does not believe that there is an appreciable percentage of employers who would deny their employees the right to organize; for instance, for a baseball team, or a brass band, or sick benefits, or co-operative stores or a Bible class. On the other hand, nobody would blame the employers for denying their employees the right to organize for some other purpose; such, for instance, as burning down the plant, or sabotage in the shops, or blowing up the works of his competitors—

*Presented at the annual meeting of the American Society of Mechanical Engineers, New York, in December, 1919.

however beneficial this might be to him in a business way, or for many other purposes.

It follows, then, that the "right to organize" must be further defined or at least limited in its scope before we can judge as to the real right of the employee to organize. If the purpose for which the employee wishes to organize is legal and proper, the third party, the general public, will naturally concede this right and quite as naturally inquire as to whether the employer has really denied this right to his employee.

The facts in most cases where this right to organize has been brought to the foreground, are these: A labor organization thinks it proper that the employees of a certain establishment should be gathered into its union. This, by the way, is perfectly proper, and no objection could be taken to it. The organization succeeds in gathering in part of the employees. The employer, fearing that this activity may lead to a strike, attempts to keep the other employees from joining the union; in other words, he tries to organize them with him instead of with the union. This also is perfectly proper. To make the claim at this point that the employee has been denied the right to organize may be good politics but is not quite correct.

It is doubtful whether in late years there have been many cases where the employer has denied the employee the right to join the union, even if he was not in favor of it. When undesirable conditions or relations existed between employer and employee, or perhaps when union activities led to a strike, it was quite customary to make a demand on the part of the men for the right to organize—yet this right had seldom been denied; but put in this way the general public would get the impression that all kinds of organizations of the employee are taboo. What is really meant by the "right to organize" is that the employer shall give, not to *his men*, but to *some labor union*, the right to come into his shop and organize his men into a union; and apart from the question as to whether this is desirable or equitable, it is certainly different from the idea which the expression "the right to organize" conveys.

Collective Bargaining

Another term which is misleading, even more so than those mentioned before, is "collective bargaining." So far collective bargaining has been collective, it must be admitted, but it has not been "bargaining." In collective bargaining it is supposed that some or all of the employees have delegated the right to bargain for them to some attorney or business agent. In practically all cases this business agent is their union, and this union, according to the term used, is supposed to bargain with the employer. As a matter of fact, however, there is no bargaining, and under the present conditions, there can be no bargaining. There have been cases where the men were entitled to all they asked for, and possibly more; there have been cases where the men were not entitled to as much as they asked for, but the method of bargaining has never been employed, and, in the writer's opinion, *could not* have been employed, to settle the differences. The issue has been brought to a conclusion by strikes, or threats of strikes, which is no more a method of bargaining than when a man points a gun at his debtor to collect a bill. The fact that the bill may be due to him, and even overdue, does not make this a method of bargaining.

There is still another point about this question of collective bargaining which should have all the light possible thrown on it. Is collective bargaining, bargaining by *all* the employees? Is it bargaining for a group or part of a group? If it is bargaining by a union, acting for a group, should the representative, the union, show credentials before bargaining starts? Such a course of action might reveal the weakness of the union or of the employer, but would it not be for the best interests of the third party, the general public?

In offering labor and demanding money, one of the principal requirements of a bargain is missing. When we say that the price of eggs is 75 cents, we mean, per dozen. When we say that the price of land is 200 dollars, we specify, per acre. But when we say that the price of labor is 75 cents, we do not know what this means. There are measures or quantities by which to sell eggs or real estate. But when it comes to buying labor we have no measure nor can we estimate its value by personal observation—except after the labor is done, which is long after the so-called bargaining took place, long after the price was set.

At the present time labor is not sold by measure but a workman sells his time. *This inability to strike a bargain because the value of the product to be sold is entirely unknown, is, in the writer's opinion, one of the greatest difficulties to be overcome before there can be an equitable adjustment of the differences between employer and employee.* The fact that labor is sold by the hour is equally unjust to both parties. Sometimes the employer suffers, sometimes the employee. In all cases it is a source of curtailment of production, and this leads at once to a discussion of wage system.

"Wage" is defined as remuneration for work done. It is also defined as remuneration for time given. The second definition seems to be defective. In the first place, when money is paid for time given it is called "salary." In the second place, and this objection is more serious, time alone is not bought or paid for. There are many occupations in which the employee must wait until something turns up for him to do, and then he is supposed to do it. Take the example of the stenographer, the watchman, the bridge tender, the

crane tender, the machinist's helper. Such people may be idle for a long time, but finally there comes some occasion when they have to do work, and they are supposed to do it. It would not be proper, then, to say that they are paid for their time. It would be more proper to say that they are paid for the labor which they perform within a specified amount of time. Besides time and labor there enters into such cases the requirement of physical presence. When a stenographer is supposed to give eight hours' time, he or she is supposed to be at a given place within that time, say, at the office. That such people are not merely paid for their time is emphasized still further by the fact that they are not paid more when they move further away from, or less when they move closer to, their place of employment.

There are cases where, practically speaking, time alone is sold. Such is the case, for instance, with a stationary watchman. Even in such an extreme case something more than time is paid for: the man's watchfulness and faithfulness. In other cases time and labor are paid for: for instance, with a machinist's helper, or a blacksmith's helper. In still other cases time and skill are paid for: for instance, the man running a large planing machine or boring mill. The writer cannot think of any case where wages or salary are paid for the amount of time alone spent on the job.

In the great majority of cases it is labor that is wanted, or rather the results of labor, and not time. The great problem before us is to find a measure for this labor in order to obtain an equitable way of paying for it. In even the simplest operations of labor there are so many factors which modify the result that it is difficult to establish a unit of measurement. In some of the more complex work it has been possible to subdivide the operations to such an extent as to set a fixed time for a given operation. Such is the case where single operations are done by an automatic machine to which the operator feeds the material, or where he operates a simple machine and performs simple operations such as drilling with a sensitive drill press, using jigs, etc. But even in such simple operations some factors enter which will cause trouble at times; trouble with the machine, breakages, replacement of tools, and the like, are such disturbing factors. However, in such work the disturbing factors are a small percentage of the total, and can be estimated close enough to establish a fair value. It would be possible to extend the number of such operations very largely, but it would require the active coöperation of labor to do it successfully.

In a large portion of work there is a combination of time, physical presence, labor, skill, knowledge, judgment, and probably other factors which are hard to define, such as reliability, steadiness, enthusiasm, loyalty, ambition, and whatnot. To make up a formula which would embody all these elements and from which a man's value could be calculated is, of course, impossible; and yet, unless this can be done there is no possibility of avoiding differences of opinion between employer and employee as to the value of a man's labor. The writer has gone into this matter somewhat at length, because to realize that a mathematical solution is not possible is also to realize that a compromise system *must* be developed.

There are various systems of payment in existence at the present day—there are straight wages, piece-work system, various systems of bonus payment, premium payment, and combinations of these systems.

The wage system considers nothing but time and physical presence. A man is selected for a certain task because he or some one else claims that he is fit for that task. If his work is satisfactory he is retained; if not, he is dismissed. Both employer and employee have made a guess. The employee knows exactly what he will get, and guesses at what he will have to deliver. The employer knows exactly what he must deliver, and guesses at what he will get. He has no means to bring the employee's output up to his conception of what it should be, unless the employee falls so far behind the employer's expectations that he makes a new guess and fires the man.

With the piece-work system the employer knows exactly what he will get for his money, but the employee makes a guess as to how much he can reasonably do; he has no control over the conditions which will enable him to do, or prevent him from doing, as much as he is expected.

There are various kinds of bonus systems. The employee may earn his regular wages and get a bonus at stated intervals if his work exceeds the expectations of his employer; or he may be working under the task-and-bonus plan, in which case there is less guessing and more of an attempt at a definite bargain. If the employer is in earnest with such a system, and sees to it that it is possible for the employee to fulfill his task, then this system approaches quite closely to true bargaining.

The premium system is an attempt at gaining the interest of the employee by making him invent improvements in the method of working and sharing the profits with him; but unless the time originally set was carefully studied, and unless all conditions of machinery, tools, existing knowledge and related matters remain unchanged, this system also will lead to controversies and injustices.

To sum up, the pure wage system is no bargaining in any sense of the word; the piece-work system is only bargaining if employer and employee have reached an agreement, and if there is some mechanism by which this agreement can be changed as soon as conditions change; the pure bonus system is nothing else but a

wage system with a kind of profit-sharing plan; the task-and-bonus system, if properly worked out and if accompanied by complete instructions to the employee, is a perfect bargain, but must be constantly revised as conditions change. However, the last-mentioned system carries with it the necessary mechanism to effect these changes.

Whatever attempt has been made up to date to place labor on a contract basis, on a basis of bargaining, has been done entirely by the employer, and has been opposed by organized labor. And yet it is the writer's opinion that the ultimate solution of labor trouble must be based on some method of bargaining, probably collective.

Labor unions are fighting organizations. The underlying principle of their conception was to find the necessary strength in numbers. The unions were the army with which the laboring man fought the employer. There was no other means of accomplishing the aims of the laboring man except to fight, and fight they did; and if fighting has given them, if not all, at least a large portion of what they desired, it is but natural that they should consider war the best means of reaching their ends. Being a war organization they had to consider the employer as the enemy, and as a consequence every act of the employer was to them an act of the enemy, something intended to defeat the union and its aims. The unions, so far, have not offered any constructive suggestion, and this cannot be expected from a fighting organization. Furthermore, it is to the personal interest of union leaders to hold to this system. It may be taken for granted that there have been, and are, many unselfish union leaders, but this does not offset the general tendency of the system to perpetuate itself as a fighting organization, because this has in its turn a tendency to further the interests of the officers.

Another reason why the attempt of the employer to put labor on a contract basis has not been well received by the labor unions, lies in the historical fact that on account of occasional scarcity of work it became one of the principles of the union to take measures to insure that whatever work was available should be sufficient to keep the union men in employment. The three chief means used to accomplish this were: first, to prevent anybody but union men from working at the trade; second, to limit the number of apprentices, or in general, newcomers in the union; third, to limit the output per man. The second item has not been strictly adhered to because it was found that by limiting the number of men in the union the number of men outside the union was increased, thus decreasing the relative fighting strength of the union. The first item has been strictly adhered to, but has often been denied by the union, probably for the purpose of satisfying public opinion. The third item is still generally adhered to, but is mostly camouflaged. Whether the unions should be condemned or praised for the attitude they have taken, is a matter of standpoint. If the true status of the union is that of a fighting organization, then no objection can be taken to these methods. We should not expect war without guns or accidents. Whether the interests of the world at large are best served by having the unions act as fighting organizations is more than doubtful, and the writer for one believes that it is time for the unions to forget some of the past, turn over a new leaf, and prepare for a future in which there shall be peace, progress and production. Taking the aims of organized labor to be proper share of the proceeds of labor, reasonable working conditions and working hours, right to organize, and collective bargaining, the writer believes that these could all be accomplished without strife if the last item, collective bargaining, were put into actual practice instead of being a mere catchword.

If employers and employees together would put as the first item in their catechism the truth that *the world must produce more in order to have more;* if employer and employee together would try to find an equitable way of estimating the value of work done; if both would subscribe to the truth that no permanent gain can be made by wearing out a man's capacity for work nor by allowing him to work less than he should for the good of the world at large; if then employers and employees together would organize a bureau of research for defining the conditions under which various classes of work should take place; and if finally an attempt was made by both employers and employees to classify men according to their natural or acquired ability, there would be very little reason left why a union should be a fighting organization.

If the writer were the owner of a machine shop and the business agent of a machinist's union should come to him and say that his union did not admit members who are not bona-fide machinists, who are not sober and industrious men, and that the union would see to it that the men would treat the management in a fair and equitable manner, but that, on the other hand, it would want a share in the management in so far as working conditions, wages, working hours, etc., are concerned, and that it would not permit anybody except members of that union to work in that shop, the writer would probably fall around that business agent's neck and hail him as a savior.

Such conditions cannot be brought about at once, nor in a very short time, but they *can* be brought about and now is the time to start the preliminary work.

Up to the present time the unions have acted entirely through their business agents, who sometimes had, and more often had not, a clear idea of the problems involved in the trade they represented. What-

ever knowledge they might have had was not permitted to come to the foreground. One does not make allowances for the enemy's good points during war. It seems to the writer that the time has come for the unions to take the first step along the lines of considering union activities as a legitimate business, and legitimate business cannot shut its eyes to facts, however disagreeable to contemplate they may be. It is his belief that the crux of the solution lies in the establishment of a proper wage system, and that in order to establish such a system *the engineer must come to the assistance of labor* in order to find standards of value for work done. Though it is not likely that there will ever be a time when every human activity can be scheduled and analyzed, yet by far the greater part of industrial operations can be treated in this way. The relatively few operations which cannot be classified and treated in this manner would be such a small part of the total that it would be easy to find a way to compromise when such exceptions occurred.

The value of driving a rivet in some dangerous place of a new skyscraper is higher than that of driving a rivet in a boiler shop

In estimating the value of operations we must drop to a large extent the idea that wage is the compensation for time. It should be made a compensation for product delivered. The value of the product changes constantly. Changes may be due to the desirability of the product, or to the means employed to produce the product, or to the law of supply and demand, or to other causes. In other words, the relations existing between various products are ever changing; consequently, whatever estimate is placed on the value of the product of labor should be changed from time to time, so as never to have too large a difference between the actual and the estimated value.

It hardly need be pointed out that to set such standards of value of work must necessarily be a gigantic task. In addition to the many technical difficulties in estimating values of products, there are other elements which must not be forgotten. There are many cases where operations are required which call for extreme skill, possessed by only a few—a skill which can never be found in the mass of the people. As a rule, people possessing such skill love to employ their gifts, they love their work and are willing to produce for less than their product is worth. Such skill should be estimated at its proper value, not only as a matter of justice to the workman, but also because he may finally lose his enthusiasm, and industry at large would suffer.

There are operations where steady nerves are essential, some where physical courage is required, others which cannot be successfully carried out without many years of experience. Such points should all be considered. *The value of driving a rivet in some dangerous place of a new skyscraper is higher than that of driving a rivet in a boiler shop.* The ability to judge the temperature of a piece of steel by its color is obtained by many years of experience and it could not be called skill, though it is closely related to it.

Consideration should also be given to what constitutes a proper minimum and a proper maximum wage. In repetition operations it is sometimes possible for the operator to produce large amounts of work but only at the expense of extreme weariness, and in the long run such a man is not employed to the best advantage of the world at large. Recognition of this fact has led to the prescription of rest periods. On the other hand, there may be cases where it is expedient to employ men not skilled in the operation they are supposed to do. This may happen because skilled men are not available at a given time or place, or because special conditions call for an unusual amount of this class of work. Though the value of the product of such men might be low, they should receive not less than a minimum wage. This minimum wage, however, is in itself difficult to determine. A satisfactory minimum wage for an unmarried young man is not at all satisfactory for a married man with a large family.

It is really superfluous to point out the many disturbing factors acting against the establishment of wages in proportion to product. What the writer wishes to emphasize is his belief that, notwithstanding all the difficulties that have been mentioned and the great many other difficulties not mentioned at all, it will be found possible to classify a large portion of the work of the world in such a manner that wages can be set to such a degree of scientific accuracy that the variations caused by the disturbing facts will not be so large but that they will lend themselves to compromise. It is further his belief that such a classification cannot be accomplished by the employers alone, nor by the laboring men alone, but that there should be an attempt at a concerted effort of employers and employees to bring about such a classification. He believes further that when these two classes are working together for a constructive purpose they will find so many things in common that they will be more apt to forget their differences. Finally, he wishes to state once more this belief: *That the real cause of the present-day unrest lies in the fact that there is no unit of measurement which both employers and employees can use; or, in other words, the fact that our present wage system is not based on knowledge and justice, but only on guesswork and on the fear that the one may "do" the other.*

Drawings for Factory Use

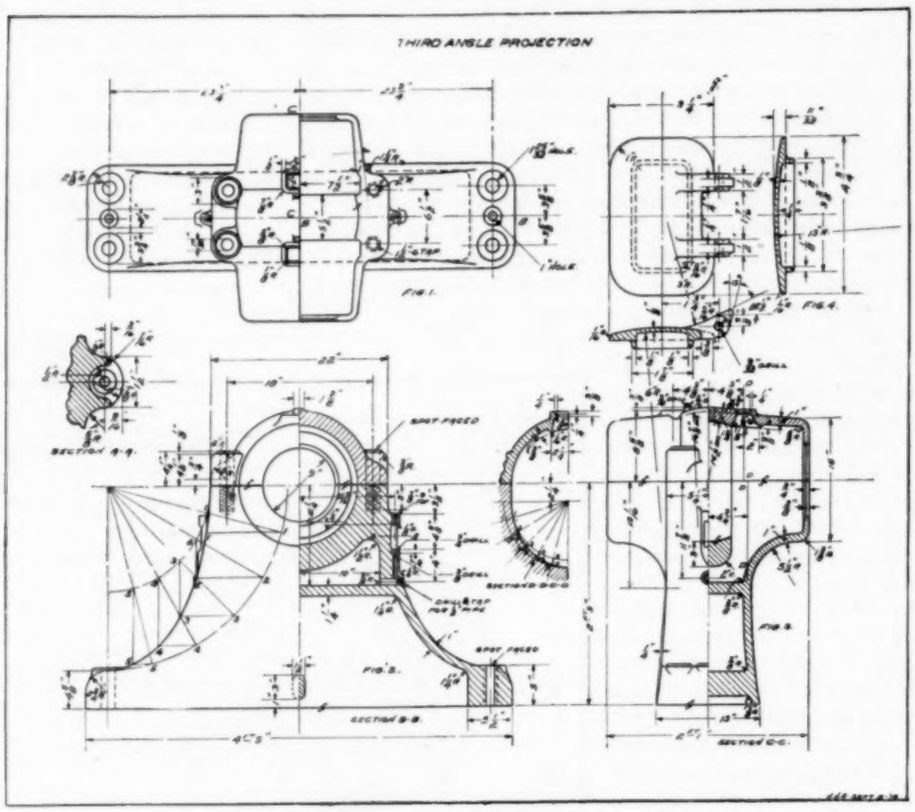
By Harry H. Armstrong

The manner in which drawings are dimensioned for use in the factory is of no little importance, and the simplicity of dimensions on a drawing is just as important as the delineation or projections of the article itself.

To begin with, not only one class of mechanic works from a drawing; if it is a casting, the patternmaker, molder, and machinist have all got to do their part, and each will have dimensions to work from that do not interest the other fellow primarily. Also on forging drawings, the blacksmith makes the rough piece, and the machinist does the machine operations, to make it ready for the assembled device.

In the illustration given, we show three views of a pillow block casting, three enlarged views of the oil door, Fig. 4, and two partial sections, in order to bring out clearly the construction of the article portrayed.

In Fig. 2 we show the side elevation of the pillow block. The left half is looking at the outside surface, while the right half is a section through the center line marked *BB*. Examination of this view will show how the patternmaker can readily find the dimensions he needs, and also the machinist's dimensions are plainly shown. Notice the enlarged section *AA*, to show plainly the construction of the oil indicator, and from the sections *AA* and *BB* this construction is clearly portrayed.



SAMPLE OF SHOP DRAWING

The end view of the pillow block is shown in Fig. 3. Here again the left half is looking at the outside of the casting, while the right half is taken on the section line *CC*, to show plainly the interior and its construction.

Another section is shown, namely, *DDDD*. This is made in order to show the construction of the oil-door receptacle, and also the elliptical shape of the basin, into which the bearing is placed when assembling.

The delineation of the oil door, Fig. 4, is for the patternmaker mostly, as the machinist has only to drill the holes for the hinge rod.

The drawing is made third-angle projection which is the most favored practice, and firms that have been using first-angle projection are gradually swinging to the former method.

Do not get the habit of scattering the dimensions of a certain "boss" or "counterbore" over the whole drawing, but confine your dimensions to at least two views. It means lost time in the pattern shop for the patternmaker to hunt all over the drawing for dimensions that could be confined to one or two views. A good mechanical draftsman soon gets his name up in the factory by the simplicity of his dimensioning.

In Fig. 1 of the drawing, the plan view of the pillow block is shown. Notice that, on the right-hand side, half of the cap is omitted; this is done to show the construction of the basin, looking down into it. It will be seen that the cap is a separate part from the standard or base.

This drawing is not a perfect sample, but is merely portrayed to show the amateur draftsman, or the ambitious mechanic who wishes to be a draftsman, how to set forth dimensions properly, so that the article may be produced in the factory with the least possible delay or confusion.

The draftsman or designer who, in making a drawing, sees it from the patternmaker's or machinist's point of view, is the man who is going to forge ahead and produce results in production.

Always remember it is easier to change a drawing or tracing in the drafting room, than it is to change a pattern or machine in the factory. Therefore, if dimensions are not plain, or the printing is doubtful, take the time to rectify these points and save future trouble by having your drawing right.

Lastly, a good draftsman is not above going to the factory for information from the mechanic. He is the man who understands the tools which make the article, and can offer valuable advice.

Holding a Piece on Parallels on a Magnetic Chuck

By I. A. Hunt

On page 148 of *American Machinist* we note an article under the above title by Joseph C. Fisher.

While Mr. Fisher's idea would apply to certain magnetic chucks, we would like to call to his attention the fact that it would not apply to Heald chucks or to certain other types, due to the fact that the frame of the chuck is not magnetized. On Heald chucks it would be necessary for both parallels to be placed on the pole pieces. As these poles are alternate, positive and negative, the parallels must of course be located on opposite poles.

Industrial Motor Control—III

By C. W. STARKER

In many ways control apparatus for alternating-current motors is similar to that employed in direct-current service. This article reviews manually operated control apparatus suitable for machine shops using alternating current.
(Part II was printed in last week's issue.)

WITH alternating-current motors of small capacity, there is no objection to connecting them directly to the line at starting. With 3- to 5-hp. polyphase, squirrel-cage induction motors, this is usually done by a starting equipment such as shown in Fig. 23. Fuses and switch are mounted on a slate panel, which is inclosed in a sheet-steel case to meet safety requirements. In good practice this case is so designed that the door cannot be opened until the motor and fuses are disconnected from the line. The switch is of

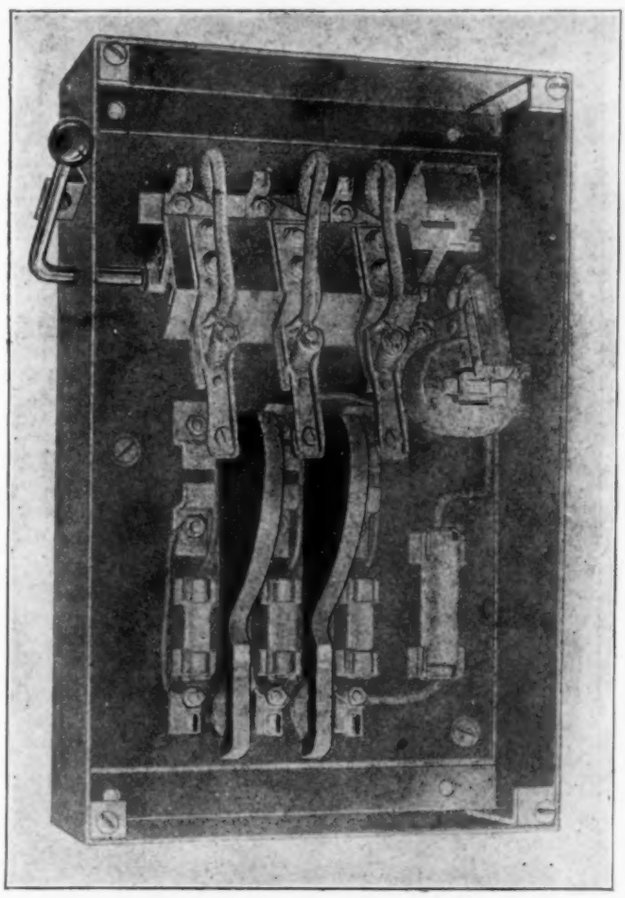


FIG. 23. A TYPICAL POLYPHASE ALTERNATING-CURRENT MOTOR STARTER

the three-pole type, as primarily intended for three-phase circuits, but the same equipment can readily be used on two-phase circuits by permanently connecting the fourth lead to the motor. In fuse switches of this type arrangements are made to have the fuses out of the circuit during the starting period, and for automatically cutting them into the circuit as soon as the operator removes his hand from the starting lever. There is therefore fuse protection against overload during running, but the relatively high starting current, being of short duration, will not injure the motor, and does not cause the fuses to blow out.

The operation of these starters is as follows: lifting of the starting lever, which projects out of the side of the case and connects the motor directly to the line, with the fuses out of circuit. As soon as the motor is up

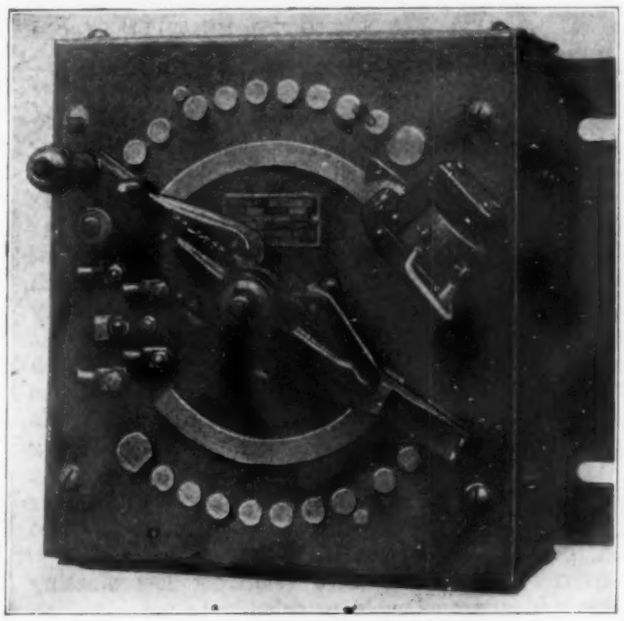


FIG. 24. A MANUALLY OPERATED STARTER FOR ALTERNATING-CURRENT SQUIRREL CAGE MOTORS

to normal speed, the operator releases the starting lever, permitting it to descend to the running position, which automatically cuts-in the fuses. A slight downward pressure on the lever, when in the running position, opens the circuit and brings the motor to rest.

This "throwing on the line," as stated, is permissible only on motors up to about 5 hp. When the motors are of larger capacity, it becomes necessary to provide

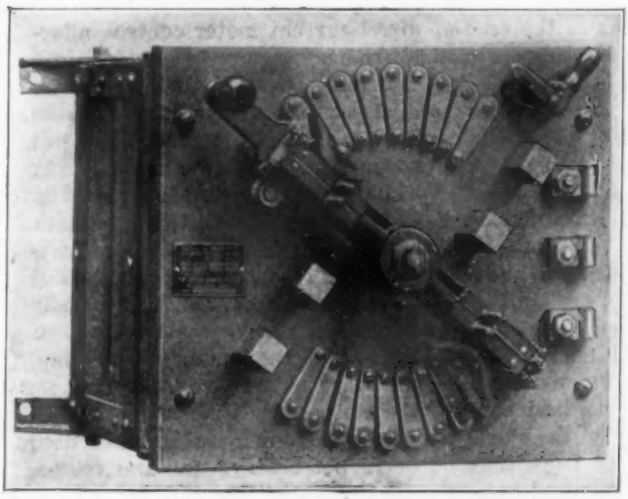


FIG. 25. A POLYPHASE ALTERNATING-CURRENT STARTER FOR SLIP-RING MOTORS

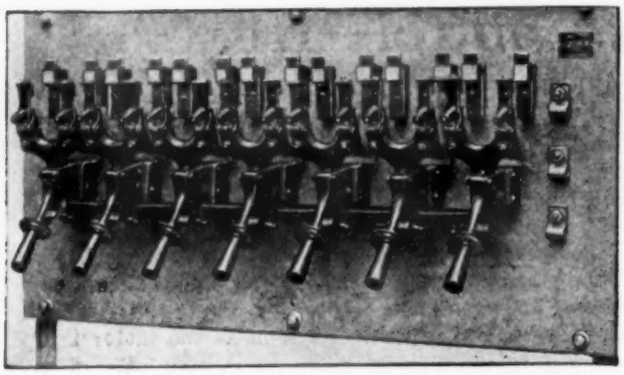


FIG. 26. A MANUALLY OPERATED MULTIPLE-SWITCH STARTER WITH SECONDARY RESISTANCE FOR POLYPHASE ALTERNATING-CURRENT SLIP-RING MOTORS

some means for reducing the current at starting. This may be accomplished in several ways: (1) Inserting resistance into the primary circuit of the motor is the method used for squirrel-cage induction motors and for single-phase commutator motors; (2) using a starting transformer, in which taps are brought out from various points of the transformer winding, which reduces in steps the voltage applied to the primary winding of the motor during the starting period (this method is commonly used for squirrel-cage induction motors); (3) inserting variable resistance into the secondary circuit of the motor, that is, the rotor (this method obviously can be used only with slip-ring motors). The number of steps required to accelerate a motor from rest to normal speed depends, with either of these three methods, upon the size of motor and also upon the character of the load.

Squirrel-cage motors have relatively low starting torque and are applicable principally to machines requiring small turning effort during acceleration such as centrifugal pumps. Motors, with wound rotor on the other hand, are capable of giving a high starting torque, equal to, or in excess of full-load torque. They are applicable, therefore, to machines which start under partial or full load, as reciprocating pumps, and air compressors. The single-phase commutator motor is also capable of exerting high starting torque during acceleration and can be used with machines starting under partial or full load.

Manually Operated Starters

As in the case of direct-current motor control, alternating-current controllers may again be divided into the two groups of manually operated and automatic or magnetic starters. A manual starter for polyphase motors from 5 to about 30 hp. and intended for use with squirrel-cage motors, starting them by inserting resistance into the primary winding, is shown in Fig. 24. Non-inductive resistance is connected into each of two phases of the primary circuit, whether two-phase or three-phase motor. This resistance is cut out by means of the double-ended lever and is usually proportioned so that approximately 50 per cent. of full-line voltage is applied to the motor at starting. If the motor does not start at this voltage, that is, on the first point of the starter, the lever can be moved to the next one, but these starters should not be used when more than 60 or 70 per cent. of full-line voltage is required to accelerate the motor. As it is not intended to run the motor continuously with resistance in the circuit, the lever is provided with a spring, which returns the lever to the "off" position, should it be left on one of the starting points. A no-voltage release, the function of which was described in connection with direct-current starters, may also be used with these alternating-current starters.

Slip-ring motors, started by resistance in the rotor, use, for capacities up to about 25-hp., manual starters, as shown in Fig. 25, applicable to either two- or three-phase motors. The resistance should be proportioned so as to allow an inrush of current at starting of approximately 150 per cent. full-load current. This starter takes care only of the rotor circuit, and a switch or circuit-breaker in the primary circuit should be provided.

For larger polyphase slip-ring motors, 40- to 600-hp., multiple-switch starters, Fig. 26, are used for manual control, if so desired. Successive steps of resistance are cut out of the secondary circuit by means of separate switches. These are so interlocked that it is

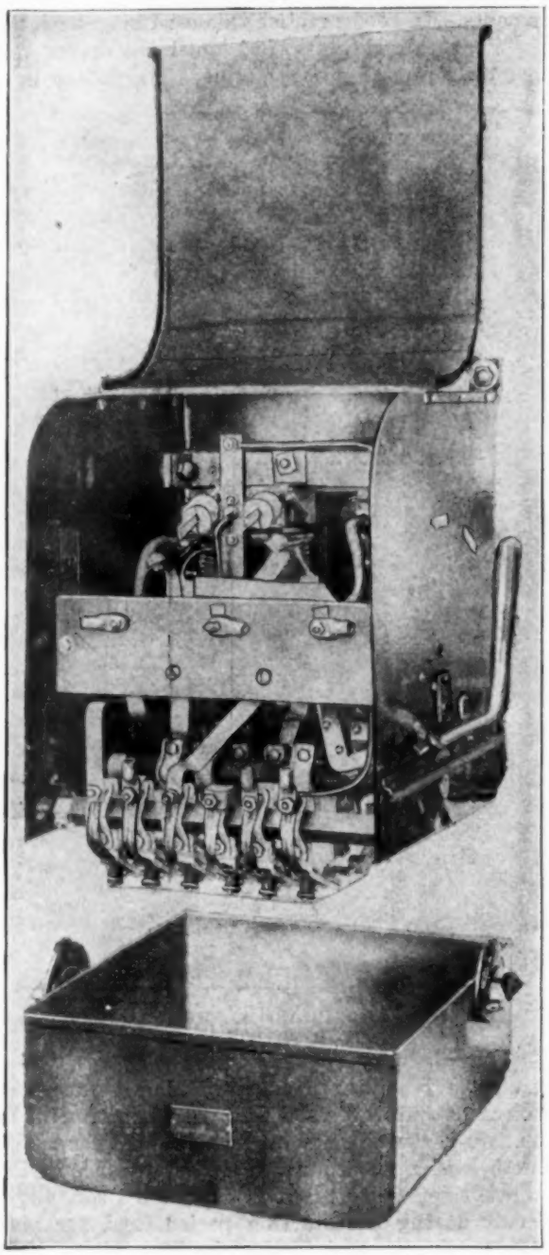


FIG. 27. AUTO-TRANSFORMER STARTER FOR ALTERNATING-CURRENT SQUIRREL-CAGE INDUCTION MOTORS

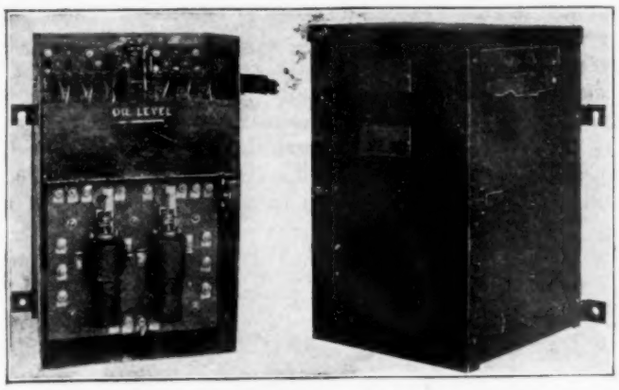


FIG. 28. ANOTHER TYPE OF STARTER OR COMPENSATOR FOR SQUIRREL-CAGE MOTORS

impossible to close them except in the proper order, and it is also impossible to leave the starter with part of the starting resistance in the circuit. The primary is again controlled by a separate switch. If a no-voltage release is provided in the secondary, it should be remembered that the primary switch must also be provided with a no-voltage release.

For single-phase commutator motors, starting rheostats, quite similar to the direct-current type are used. With alternating-current it is essential, however, that the resistor be designed so as to reduce the effect of inductance, in order that the highest possible power factor may be obtained.

Alternating-Current Speed Regulators

The speed of the squirrel-cage motor is fixed by the number of poles and cycles, for instance, on a 60-cycle circuit, 1800 r.p.m. for a four-pole winding, 1200 r.p.m. for a six-pole and so on, except that this so-called synchronous speed is reduced a certain percentage by the slip, fixed by the permanent resistance of the rotor winding. While the squirrel-cage motor, therefore, is a constant-speed motor, the slip-ring or wound rotor motor is used for variable-speed service, by inserting varying amounts of resistance into its secondary.

A polyphase speed regulator of the secondary resistance type for slip-ring motors up to about 15 hp. is shown in Fig. 27. Such regulators are designed to reduce the motor speed about 50 per cent. below normal, providing the motor takes full rated current at normal speed and the correct size of regulator is used. If the motor takes less than rated current at normal speed, the percentage of speed reduction would be correspondingly less. The terms "fan-type" and "machine-duty" regulator have been described in connection with direct-current regulators and the same distinctions are made for alternating-current work. Commercial speed regulators of the former type reduce the speed 50 per cent. with about 30 per cent. of normal current flowing, while those of the latter type use approximately 80 per cent. of the normal current. In ordering or selecting alternating-current speed regulators, in addition to the usual information on hp. volts, frequency, number of phases, fan or machine duty, there should be considered the rotor limitations; that is, the full-load current in the rotor per slip-ring, and the open-circuit voltage between slip-rings should not exceed the amounts for which the various sizes of regulators are designed. Also, independent provision must be made for controlling the primary circuit, as the speed regulator has to do merely with resistance in the secondary.

With single-phase motors of the commutator self-starting type, similar manual speed regulators

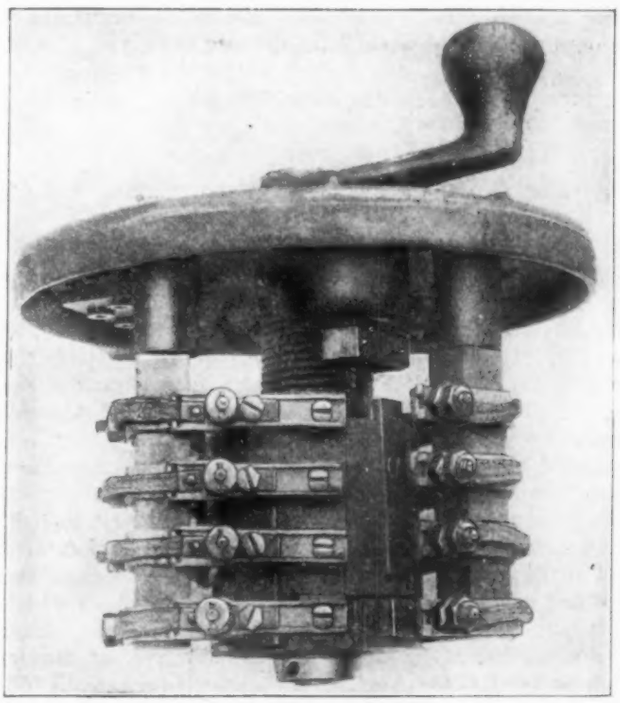


FIG. 30. A DRUM-TYPE, STAR-DELTA, OIL-IMMERSED SWITCH FOR THREE-PHASE INDUCTION MOTORS

are used. Such motors are on the market in capacities up to about 10 hp. A speed reduction of 50 per cent. with normal load is commercial practice. To determine the amount of resistors needed, the resistance in ohms, required to give the desired speed, should be calculated and specified.

Mechanical modifications of single-phase and polyphase alternating-current faceplate controllers are obtainable for individual installations, quite similar to those described in connection with direct current; for instance, bellows operated for organ-blower service, or pressure-controlled fans, gas-pressure systems, etc.

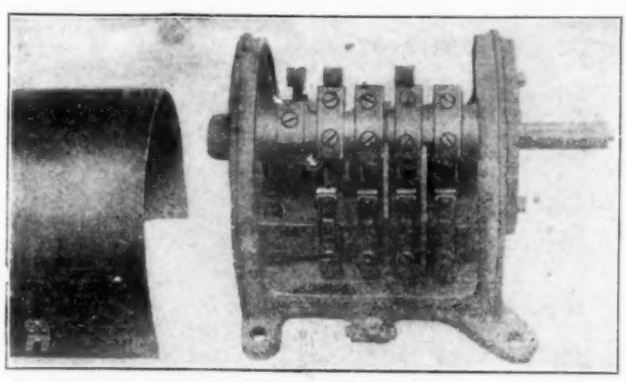


FIG. 29. A MANUALLY OPERATED DRUM-TYPE REVERSING SWITCH FOR SQUIRREL-CAGE MOTORS (COVER REMOVED)

Auto-Transformer Starters

Instead of reducing the starting voltage by inserting resistance in the primary circuit, which means loss by transformation of electrical energy into heat, the starting voltage may be reduced by means of a

transformer shown in Fig. 28. This form of manual starter is commonly employed with alternating-current, squirrel-cage motors larger than 5 or 7½ hp. These devices are known under the names of auto-transformer starters, auto starters or compensators as the principles of construction and operation are the same in all makes.

It should be understood that this type of starter is designed for use in connection with motor-driven fans, centrifugal pumps and machines of similar load characteristics, or on motors which may be started without load. It is standard practice to connect the transformer so as to supply 65 per cent. of the line voltage for starting, but different taps are brought out from the transformer winding so that by connecting the proper terminals the starting voltage may readily be changed

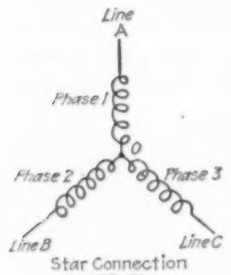


FIG. 31

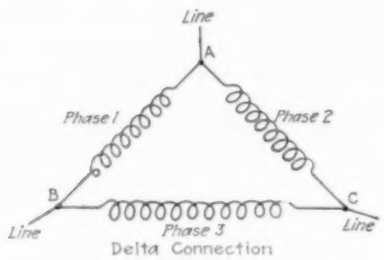


FIG. 32

FIGS. 31 AND 32. A STAR AND A DELTA CONNECTION

to either 50 or 80 per cent. of the line voltage to suit load conditions in the individual case.

The commutating mechanism, Figs. 27 and 28, consists of two three-pole switches which are oil immersed and operated by a single handle. When starting the motor, the first switch is closed, causing the transformer to be placed in the circuit with the motor thereby reducing the inrush of current. After the motor has speeded up, the second operation of the handle closes the second switch, connecting the motor directly to the line and at the same time opens the first switch, disconnecting the transformer. The construction with all makes is such that it is impossible to close the second or line-switch, until the first switch to which the transformer is connected has been closed. This is accomplished by a mechanical interlocking device. The construction is such that the handle cannot be left in the starting position, as it will return to the "off" position, if released by the operator.

Standard auto starters are provided with low-voltage releases actuated by ar alternating-current magnet which holds the second or running switch in closed position. Upon failure of voltage the latch mechanism is released, allowing the running switch to return to the "off" position by the action of a spring. To stop the motor, this low-voltage device is tripped by hand. Remote control for stopping may be obtained from one or more points by using a push-button switch in the circuit of low-voltage coil.

Inverse time-limit overload protection is provided with all auto starters. Two relays are usually provided for either two- or three-phase circuits. These relays are designed to permit current adjustment and adjustment for different time intervals. The latter is done by changing the opening in the dash-pot plunger.

Desirable features from the operating standpoint, and which all manufacturers are endeavoring to incorporate in their designs, are general ruggedness of the apparatus, easy accessibility of all parts, clean-cut arrangement of the various parts and wiring, renewable copper contact pieces with ample surface and self-cleaning properties, and, finally, sufficient supply of oil over the contacts with freedom from oil leakage.

Compensators are commercially obtainable in sizes up to 100 hp. and all standard voltages from 110 to 2200 volts, as well as all standard frequencies.

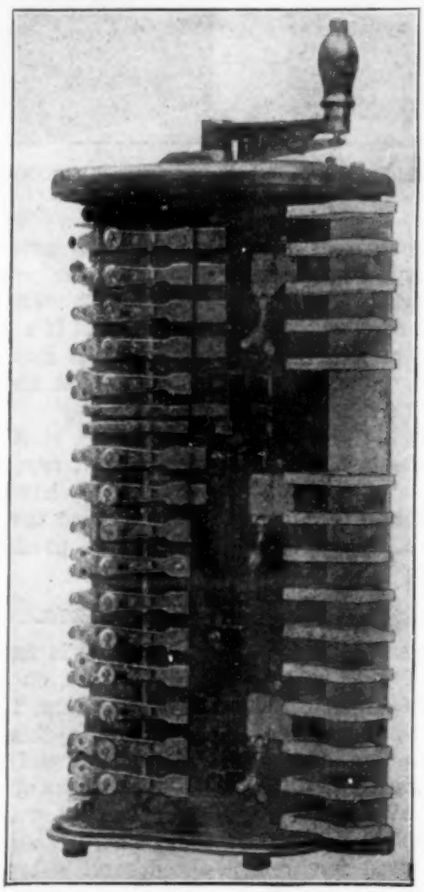


FIG. 33. AN INTERIOR VIEW OF A DRUM-TYPE REVERSIBLE CONTROLLER FOR ALTERNATING-CURRENT SLIP-RING MOTORS

Drum-type controllers are, in general, used in preference to faceplate starters, where frequent starting and stopping is required. They are rugged, easily inclosed, provided with barriers, renewable contacts, etc. They may be reversible or non-reversible, and may be used with squirrel-cage as well as slip-ring motors. Fig.

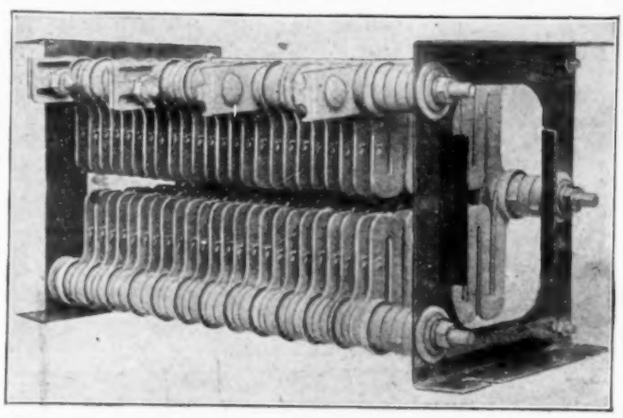


FIG. 34. A TYPICAL GRID-TYPE RESISTANCE UNIT MOUNTED IN A PRESSED-STEEL FRAME

29 shows a drum-type reverse switch intended for high torque, polyphase, squirrel-cage induction motors. This really is nothing but a three-pole switch and the motor is thrown directly on the line. This type should be used only where the maximum rating does not exceed 5 hp. at 110 volts or 7½ hp. at 220 to 550 volts and only when the starting current does not exceed two and one-half to three times the full-load current. This switch disconnects all three lines of a three-phase circuit, while on a two-phase, four-wire circuit, one lead is to be permanently connected to the motor. Manual operation may be by a hand lever or sprocket suited for rope or chain pulls.

For motors up to 20 or 25 hp. at 440 volts, similar switches, oil-immersed, can be used, provided that it is permissible to connect motors of this size directly to the line. This switch is provided with a low-voltage release magnet and is designed for one direction of rotation only. There are three sets of fingers, which engage with contacts on the drum to make proper connections. Reversing switches of similar construction are on the market for use with motors required to operate in either direction of rotation.

Star-Delta Starters

Squirrel-cage motors up to about 20 hp. capacity are frequently started by a so-called star-delta switch. For small capacities, this switch is sometimes built as a knife switch, but the drum-type, oil-immersed construction, Fig. 30, is preferable. The action of the star-delta switch is based upon the fact that the three phases of the primary winding of a squirrel-cage motor may be connected in star, Fig. 31, or in delta, Fig. 32. In the star connection the phase voltage equals line voltage divided by 1.732, and in the delta connection the phase voltage and the line voltage are identical. In other words, the current entering at *A*, in Fig. 31, passes through *phase 1* and then *phase 2*, in series; while, in Fig. 32, the current at *A* is divided into two branches, *phase 1* and *phase 2*, in parallel. The line voltage, between *A* and *B* includes two phases; in Fig. 31, connected together in the star-point *O*, while in Fig. 32, the ends of each phase are connected directly between the points *A*, *B* and *C*.

Starting on a star connection and running on a delta connection reduces the starting voltage in the ratio of 1 to 1.732, or 58 per cent., while in the running position each phase has the full-line voltage impressed upon it. The primary winding of the motor must of course be arranged for this change in connections and the switches are designed so as to make it impossible to go directly into the running position when starting. It is necessary to pass through the starting position to reach the running position and when stopping, on the other hand, provision is made for passing directly to the "off" position.

Alternating-current motors of the slip-ring type, on account of their high starting torque, are particularly adapted for crane and hoist service. A reversible or a non-reversible, drum-type controller, similar to Fig. 33, is used for this service which requires frequent starting and stopping of the motor. The three-phase or three-wire, two-phase controller provides a double-pole primary combined line and reversing switch. With two-phase, four-wire controllers, a single-pole primary switch is added for handling the second phase of the motor. All these drum controllers contain contacts for the secondary starting and regulating resistors. The resistors, Fig. 34, are cast grids mounted in a sheet-steel frame and are customarily designed for intermittent duty not exceeding 150 per cent. of the motor rating for both primary and secondary circuits, and are proportioned to reduce the speed 50 per cent. under half-load conditions. To select the resistors properly, it is necessary to know in addition to the usual data on horsepower, voltage, frequency, phase and character of load, the maximum full-load rotor current per ring, and the maximum open-circuit voltage between slip-rings at stand still.

The hand lever may again be replaced by rope or chain drive as mentioned for other controllers to suit operating conditions.

Roughing-Out Bevel Gears on a Shaping Machine

By W. H. Addis

A very unusual sight is a 16-in. crank shaping machine engaged in automatically gashing bevel gears, and that at a high rate of production. This is done in the jobbing shop of the Indianapolis Tool and Manufacturing Co.

In order to accomplish this task on a shaping machine, the following cycle of functions must be provided for:

1. An automatic downfeed for the toolslide.
2. An automatic release for the toolslide permitting the tool to clear the gash while indexing.

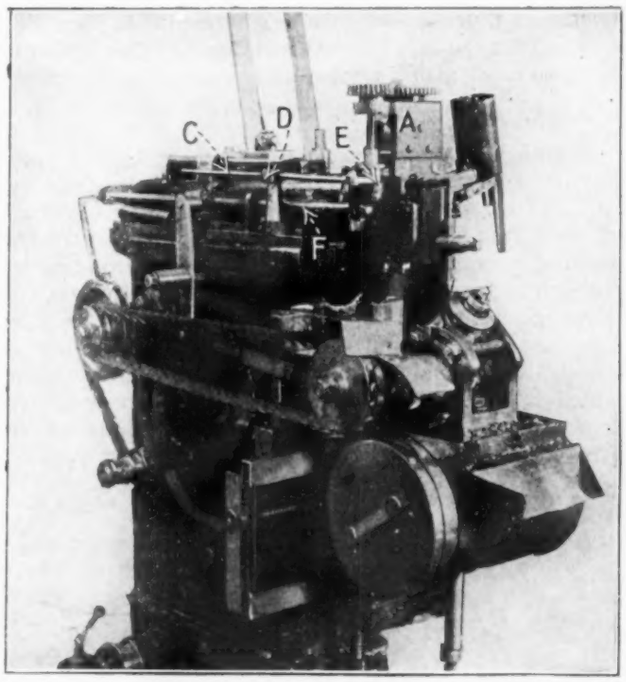


FIG. 1. A MODIFIED SHAPING MACHINE FOR GASHING BEVEL GEARS

3. An indexing device which will automatically function in unison with all other members.

It was first necessary to remove the feed screw from the toolslide. The cast-iron angle plate *A*, shown in Fig. 1, was then bored to form a housing for the timing gears and attached to the toolslide by three capscrews. Directly beneath the large timing gear on the toolslide a pair of face cams with $\frac{5}{16}$ in. rise and fall every 120 deg. of revolution of the gear, serve to impart the downfeed and release to the tool. In Fig. 2, a strong spring which

lifts the toolslide as the cam falls will be seen at *B* behind the toolslide.

It will be seen in Fig. 1 that the large gear on the toolslide is driven by the small gear. The latter is keyed to a shaft, which has its lower bearing in an angle plate screwed to the machine body. This shaft is actuated by a ratchet feed so designed that it is impossible for it to move more than one tooth at a time. The purpose of this is to prevent the tool being fed into the gear blank more than a determined depth at a cut. The clever part of this device is the method that is used to feed the ratchet. In Fig. 2 the ratchet-feed shaft *C*, which is made of ½-in. cold-rolled steel, will be seen having its bearing in the stuffing box *D*, mounted on a stud attached to the gib plate. Now it is evident that as the shaper ram moves in a reciprocating manner, the ratchet *E* which is on the head of the ram, will cause the ratchet shaft to reciprocate with the ram. Therefore by simply tightening the stuffing box to the point where its resistance is sufficiently great to overcome the resistance opposed to it by the mechanism above described in moving the ratchet forward one tooth, the reciprocating movement of the ram will cause the ratchet to feed forward carrying the driver gear with it and turning the driven gear a sufficient amount to cause the cam which is attached to its under side to feed the tool the required depth. This action is repeated every stroke of the ram.

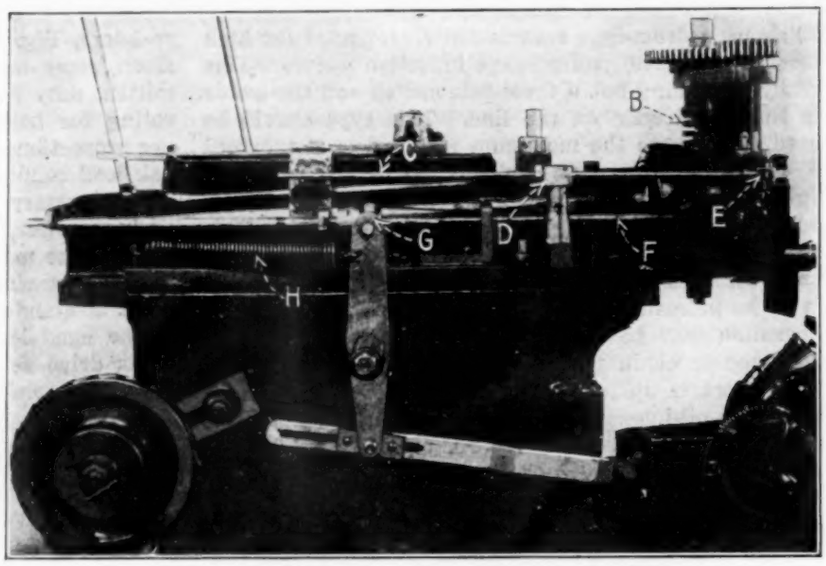


FIG. 2. A SIDE VIEW OF THE SHAPING MACHINE

TIMING THE INDEX

In both Figs. 1 and 2, a ¾-in. cold-rolled timing shaft *F* will be seen parallel with, and directly beneath the ratchet-feed shaft. This shaft is operated by the shaft of the driver gear through a pair of miter gears. The gashing operation is so timed that one revolution of the driver gear cuts the full depth gash. Now as the driver-gear shaft makes one revolution, so does the ¾-in. timing shaft. Taking advantage of this a dog is keyed to the timing shaft, so that a projecting lug which it carries on its surface will be struck by the trip which is clamped in position directly back of the stroke lever. In Fig. 2, the trip and timing dog are shown in position of contact at *G* ready to trip the rocker-arm. This will release the index pin, thus permitting the automatic index to operate. A study of Fig. 1 will show how power is transmitted from the drive shaft of the shaping machine to the countershaft and thence direct to the index head. Flanged pulleys and a special non-slip belt are used. Fig. 3 shows a close-up view of the indexing mechanism with the drive pulley removed. This drive pulley contains an internal ratchet which idles past the pivoted pawl when the index pin is in position. In Fig. 3 the index pin is shown removed. As the motion of the internal-ratchet drive pulley is clock-wise, it will be seen that the pivoted pawl with its spring tension serves to keep the index plate firmly against the pin while the gashing operation is being accomplished, but the instant that the timing dog strikes the rocker-arm and the index pin is released, restraint is removed from the drive pulley, and there is sufficient tension against the internal ratchet to index the gear blank. Only one stroke of the ram is required to actuate the rocker-arm so that by the time the indexing operation is complete the index pin has returned to its place, due to the pull of the large coil spring *H* which pulls the rocker-arm back in the position shown in Fig. 2.

The expense of special machines is usually excessive, but here is a most practical and highly efficient adaptation of the shaping machine that is neither extravagant in cost nor difficult to make.

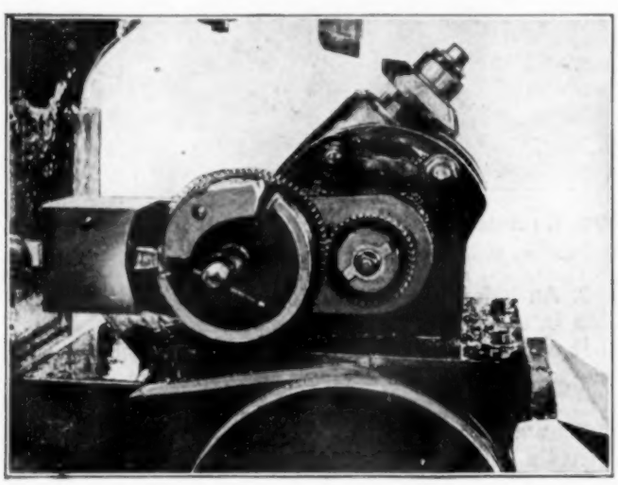


FIG. 3. OPERATING GEARS OF THE INDEXING HEAD

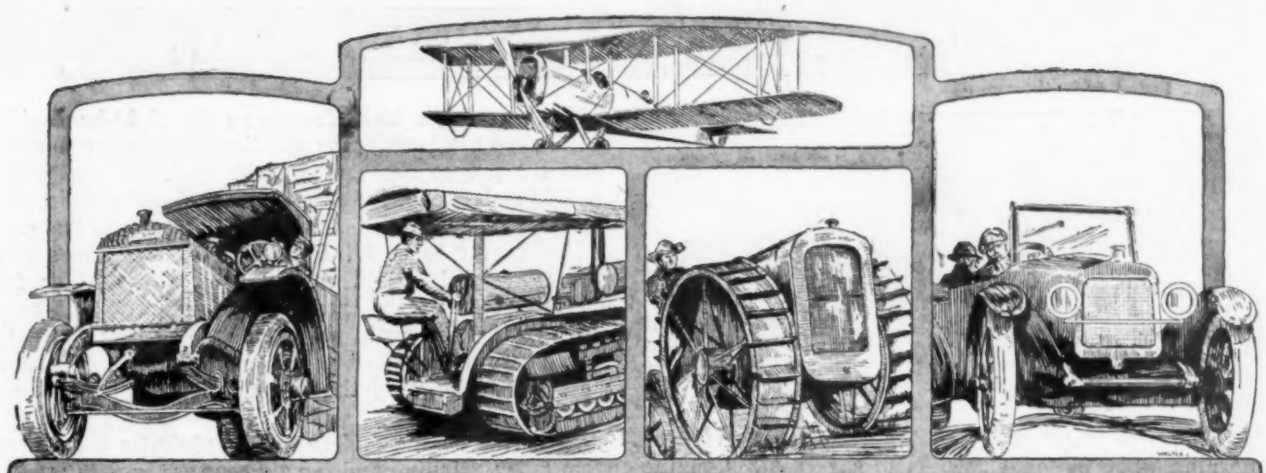
Repairs on Pump Valves

BY W. F. JOHNSON

We had been having trouble with our duplex pumps by reason of the valve seats, which were threaded into the openings in the deck, working loose and destroying the threads.

It was impossible to re-thread the openings because of their being so close to the side walls, so I reamed them out to a slight taper, made valve seats to fit them, and forced the latter into place, facing them off afterward.

The first two valves were repaired in this manner in February, 1919, and upon recent examination were found to be tight and in good condition.



AUTOMOTIVE CONSTRUCTION

"Caterpillars" and Their Construction—V

By K. H. CONDIT
Managing Editor, *American Machinist*

"Caterpillars" have been field-tested by our Army in Texas, Hawaii and Mexico, by the British on four fighting fronts, by the French on one and by the makers in this and 45 other countries. Factory tests cannot be expected to duplicate all these conditions but they are strenuous enough to develop any hidden weakness.

(Part IV was printed in last week's issue.)

PUTTING together something over 13 tons of tractor is considerable of a job and keeps the traveling crane operators on the jump. The big shop, Fig. 39, where the "120's" are assembled is no place for the unwary bystander for he is likely to have almost anything from a tote-box to a whole tractor dropped on his neck if he fails to heed the warning of the crane man's Klaxon horn.

FIG. 39. OLD ASSEMBLING SHOP

The railroad track in the center of Fig. 39 runs out of the front of the picture to the stock-room; the machine-shop door is at the right and the foundry at the left. Parts from these departments arrive by electric truck and are quickly swallowed up in the assembly stream, one branch of which starts at the far end of the shop on the left and the other about half way down on the right under the gallery. In the right-hand gallery the radiators and sheet-metal parts are put together while the left-hand gallery is devoted to engine assembly. At the far end on the right are the test blocks and stands where the motors and completed tractors are given their initial runs.

The two cranes, one of 15 tons capacity and the other of 10, have something in the air most of the time and their efforts are supplemented by various chain blocks and air hoists scattered about the floor.

The blacksmith shop is opposite the test blocks and just this side of it are the bull dozers, punch presses, shears and riveting machines which form the frames of the big tractors. In many respects this part of the building is like a bridge shop, and with reason, for the frame, Fig. 40, is largely a structural steel job. Here, too, the front wheel, Fig. 41, which is much the same sort of a proposition, is put together ready to go into its round turntable in the frame.

There is good reason for the massive construction of the tractor skeleton in the treatment that is likely to be accorded to it. They tell a story of a western rancher who took a chance on a weak bridge and dropped himself and his "75" 14 ft. into a shallow river. The service station heard of the accident that afternoon and started a rush inventory of spare parts for which an urgent call was anticipated.

AUTOMOTIVE CONSTRUCTION

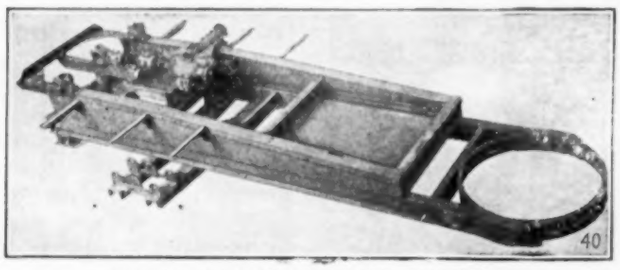


FIG. 40. FRAME OF 120-HP. TRACTOR

Nothing was heard from the rancher until the next morning when he telephoned in to say that his engine wasn't working very well and he couldn't get a spark plug where he was, and wouldn't they please send him one as soon as possible. The astounded dealer got his breath long enough to inquire about the episode at the bridge and the extent of the damage, and was informed that the canopy top had been bent a little but that everything else was all right.

The finished frame is brought by crane to the right foreground of Fig. 39 where the main assembly really begins. The first job on the frame is the layout for the location of transmission gear case and main friction-shaft bearings. Holes for the hold-down bolts are then drilled with a Ryerson radial drilling machine and these parts fastened in place. The babbitting jig, a drawing of which appears in Fig. 42, is then put in place as shown in Fig. 43 and the babbitt for the transmission and friction-shaft bearings is poured. The bearings are then reamed with the pneumatic reamer shown in action in Fig. 44 and finally handscraped as illustrated in Fig. 45.

In the meantime the various unit assemblies have been completed at their stations under the galleries. The pinion shaft, belt shaft and countershaft have been made ready for the transmission, the master clutch has been assembled on its shaft, the roller frame and main drive shaft are ready, the frictions are located in the friction wheels and the first-motion driving chains are ready to link up.

Just beyond the main frames on the right-hand side of the shop are long, heavy planks supported on horses. Here the proper number of track links for one track are laid end to end, the track pins connecting them are driven into place and the track-pin keepers are inserted and bent over to hold the pins. The track shoes and grousers are then laid on and their bolts driven in. A crane picks up the track by one end, turns it over and lays it down again other side up so that the nuts can be screwed on the track-shoe bolts. Fig. 46 shows the track undergoing the last-mentioned operation on its tables.

Up in the engine gallery the crankshafts come over from finish-grinding and the six connecting-rods are fitted to the crankpins and run in for 2 or 3 hr. in the fixture shown in Fig. 47 which is simply an old crank case with one side cut out and crosshead guides bolted on in place of cylinders. A good feature of the fixture is the quick action of the front plates of the crossheads which have inclined slots sliding on two guide screws and are locked in position by clamp nuts.

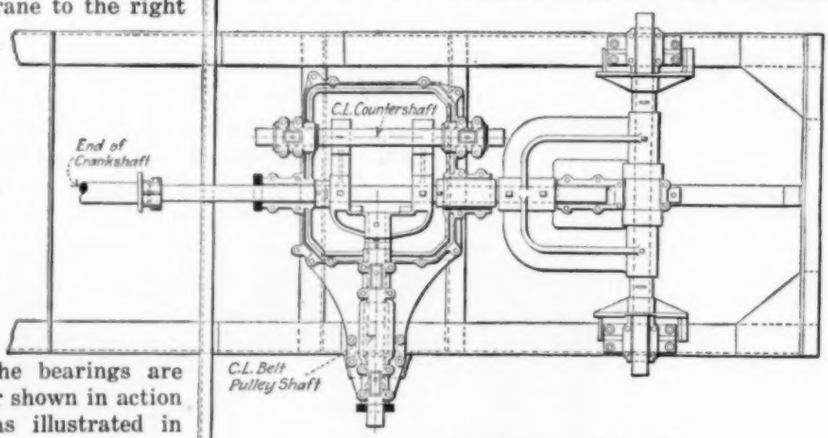


FIG. 42. BABBITTING FIXTURE

The crank case is carefully cleaned and painted white inside and the crankshaft is then put in and spotted down on the bearings. This usually takes about two days and the bearings are then run in for from 8 to 16 hr. An 85-per cent. bearing surface is required.

The next step is to assemble the cylinders, rods and pistons which takes about two hr. and is followed by a further running in of 1½ to 2 hr. The rod bearings

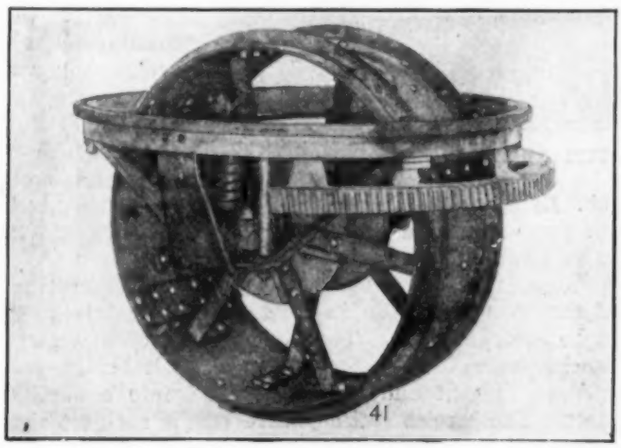


FIG. 41. FRONT WHEEL

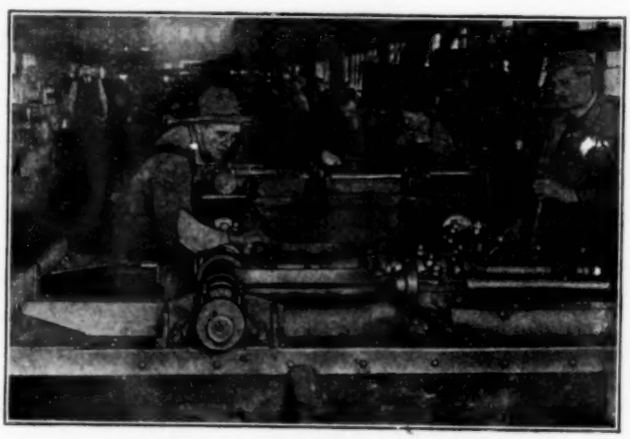


FIG. 43. POURING THE BABBITT

AUTOMOTIVE CONSTRUCTION

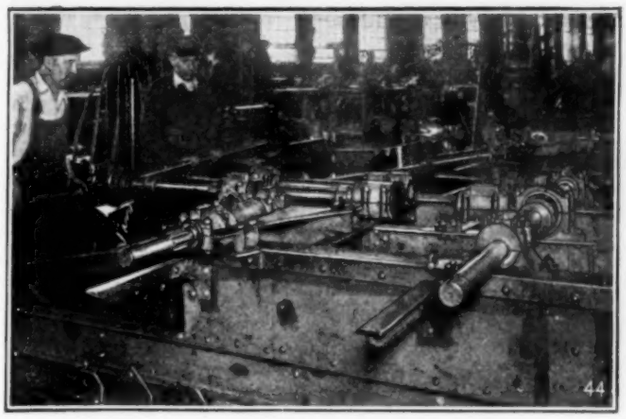


FIG. 44. REAMING THE BEARINGS

are then inspected for bearing surface which must also be 85 per cent. This inspection passed, the motor goes on to final assembly where the camshaft and gears, pushrods, manifolds, carburetor, magneto, etc., are installed.

The finished motor is pushed out on the pulpit which is dimly visible near the back of the shop on the left in Fig. 39, and picked up by the crane to be dropped on the test block near the door. Here it is given dynamometer test run of 8 hours.

At the conclusion of the test run the motor is taken to the partly assembled tractor and lined up. It rests on a rigid cross-member at the rear but the front end is carried on a cross-piece which is pivoted so that it can rock transversely thus providing three-point support. The pivoted support is drilled for the motor hold-down bolts and these are dropped in place and remain until the rear holes have been spotted. The motor is then returned to the block for inspection and the holes in the rear cross-member are drilled.

While waiting for the motor to finish its test the tracks have been put on, the platform mounted and holes drilled for the bolts which hold it, and the various gears and shafts put in place and fastened down. With the motor in position the master clutch can be assembled to connect motor and transmission, the frictions, drive chains and controls connected up and steering wheel and radiator and water pump mounted. When the fuel and water tanks have been added, the tractor is taken down to the test blocks where it is mounted on heavy horses with its tracks free to revolve and run for 8 hr. at about 300 r.p.m. to smooth out the rough spots and make adjustments.

After the block test the transmission cover is put on and fastened down and the machine is turned over to the field tester for 16 hr. of punishment, of which there is more later.

In a newer part of the plant they are assembling the 10-ton artillery tractor. Fig. 48 shows this shop with progressive assembly on trucks proceeding at the right of the picture. One difference here that strikes the observer at once is the use of a one-piece frame made of cast steel instead of the riveted structural type. Fig. 49 shows this frame with two side extensions in place. The very low percentage of rejections, less than 1 per cent., in these castings was rather remarkable. A special wheeled carriage for radial drilling operations on this frame is shown in Fig. 50.

In this shop, as in the older one, unit assemblies proceed in the side bays and join the main stream as need-

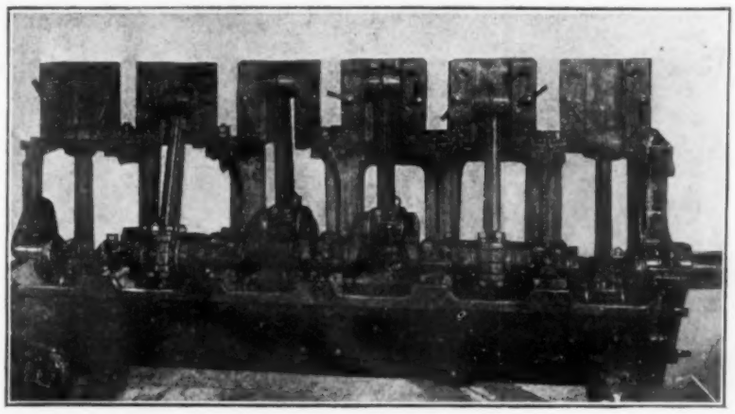


FIG. 47. CRANKSHAFT RUNNING-IN FIXTURE

ed. The finished machines are run in on horses near the far door and driven outside for further testing.

Originally this testing was conducted in the factory test field which is one of the roughest and most unpleasant looking places for pleasure driving imaginable. Here they were driven round and round until they had

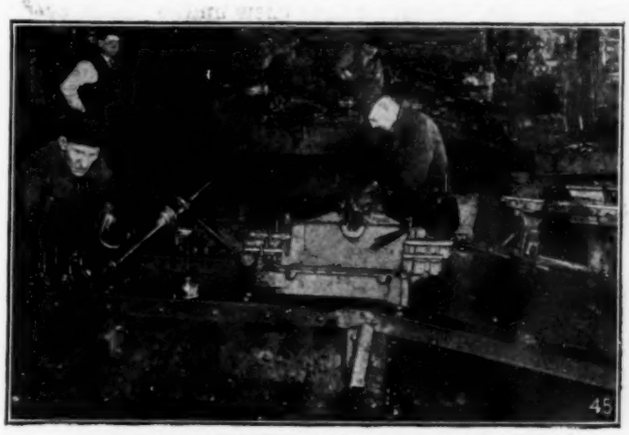


FIG. 45. HAND-SCRAPING THE BEARINGS

FIG. 46. FINISHING THE TRACK ASSEMBLY

AUTOMOTIVE CONSTRUCTION

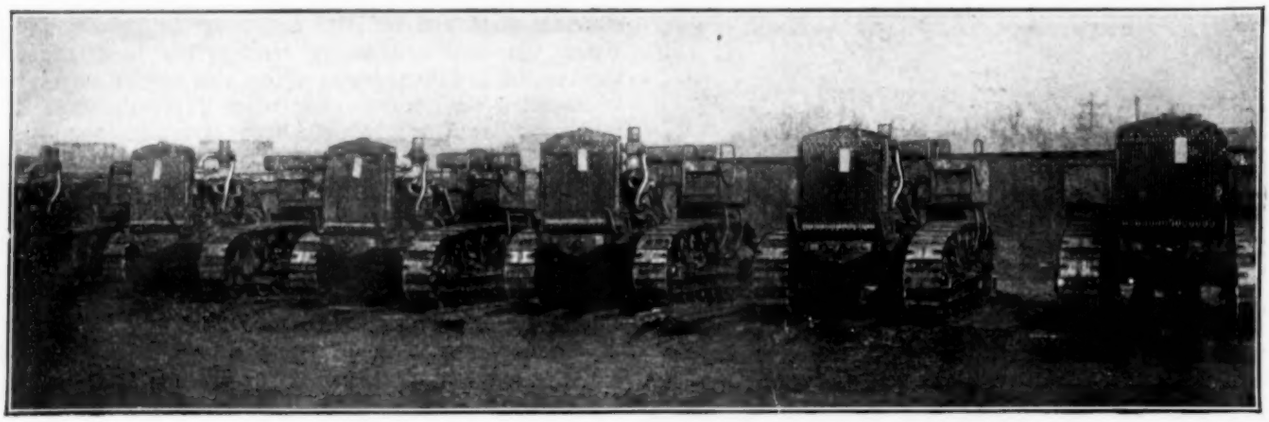


FIG. 51. FRONT VIEW OF 10-TON ARTILLERY TRACTORS ON TEST

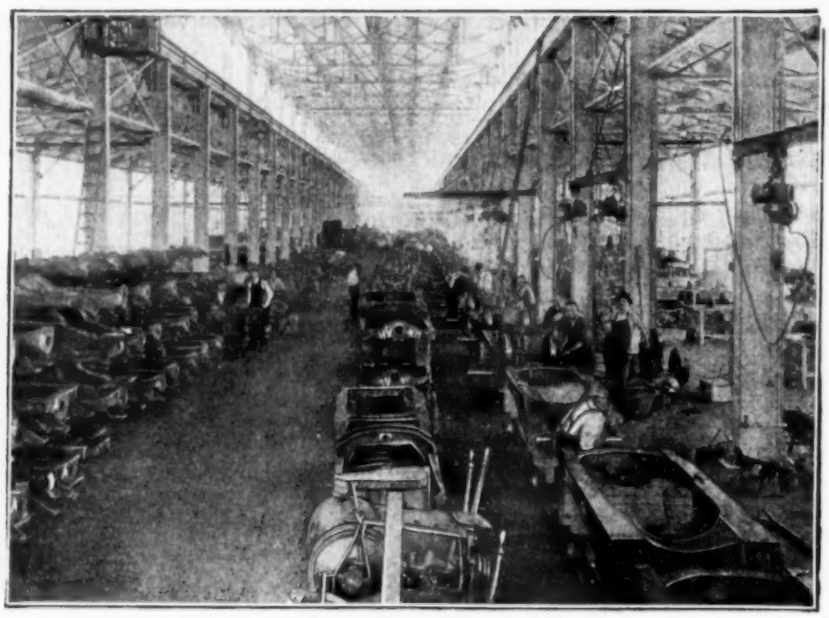


FIG. 48. NEW ASSEMBLING SHOP

made their 20 mi. and if it rained it was almost as much of a job to clean the tester as it was to wash the tractor. Besides, the difficulty of making adjustments to mud-encrusted tracks and friction clutches was enough to daunt any but the most conscientious tester, and things sometimes got by as "good enough" which might have been better.

Then some ingenious individual hit upon the testing device illustrated in Figs. 51 and 52. It consists of a heavy timber frame with a well-braced end piece to which the tractor is chained so that it can't get away without breaking something. The grousers are taken off and the smooth tracks travel around on ordinary heavy planks. Of course they chew up the planks every

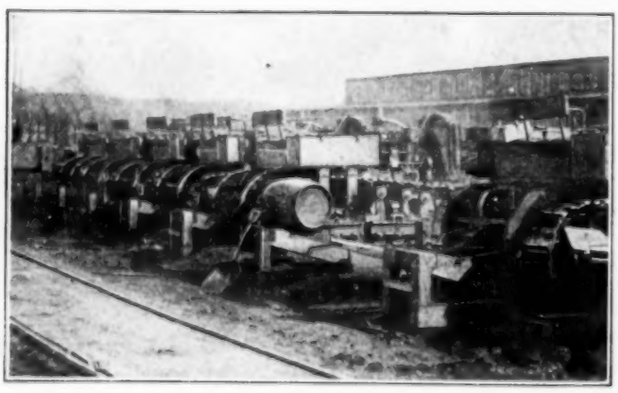


FIG. 52. REAR VIEW OF ARTILLERY TRACTORS ON TEST

FIG. 53. A DRY DAY IN THE TEST FIELD

AUTOMOTIVE CONSTRUCTION

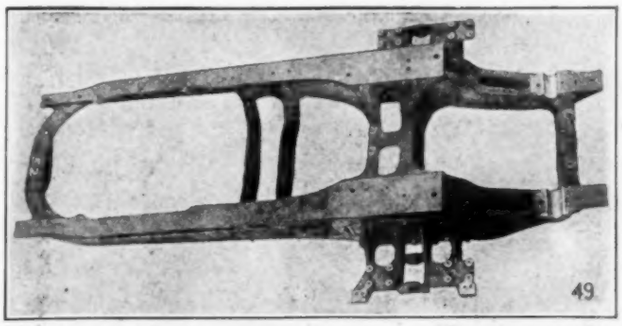


FIG. 49. CAST-STEEL FRAME OF 10-TON ARTILLERY TRACTOR

little while and new ones have to be put in, but this expense is infinitesimal compared with the saving in labor, for two men can take care of 10 test stands and get better results than the old system, with one man to each machine, ever did. They do their 20 miles standing still and stay perfectly clean while they are doing it, and the tester can get right down alongside and watch the tracks go round. He can thus make his adjustments more intelligently and far more accurately than he could with two inches of mud over everything.

Since these pictures were taken a very simple safety device has been added to the test frame. An upright is nailed to the end piece and from it a piece of wire leads to the ignition switch so that, should the tractor break loose, the wire would cut the switch and stop the machine before it went through any buildings, which was not unlikely.

To make sure that these machines are still able to navigate bad country, about one in every 10 is taken to the test field and put through the regular stunts which all the "120's" have to do. Fig. 53 shows one of the big fellows out on the test field on a dry day, a little uneven, but not bad going. Fig. 54 shows the same place on a day which was not so dry and portrays some of the joys of tractor testing.

Testing at the factory is not confined to the test field, however, as will be seen in Fig. 55, which shows some hill work not very far from the factory. This same Nigger Hill, as it is called, has been the scene of many crucial tests. Beyond Nigger Hill is a stretch of highway which the Holt people have adopted and dubbed the "Caterpillar Trail." They keep it in condition and in so doing try out their tractors on road-building work.

One of the most spectacular tests pulled off near the factory occurred during the heavy blizzard of 1918, which blocked traffic all over the country. The account written by a reporter for one of the Peoria papers gives a good picture of the performance:

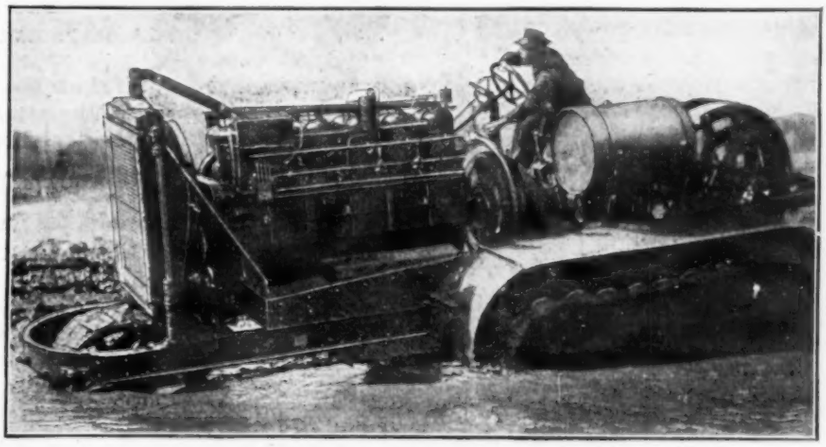


FIG. 54. DAMP WEATHER IN THE FIELD

"The Holt Manufacturing Co.'s 3-ton Packard trucks used for freight transportation clogged down in the

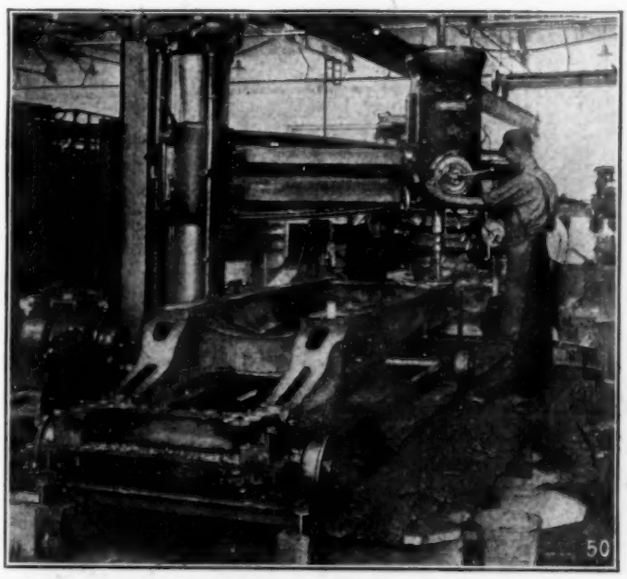


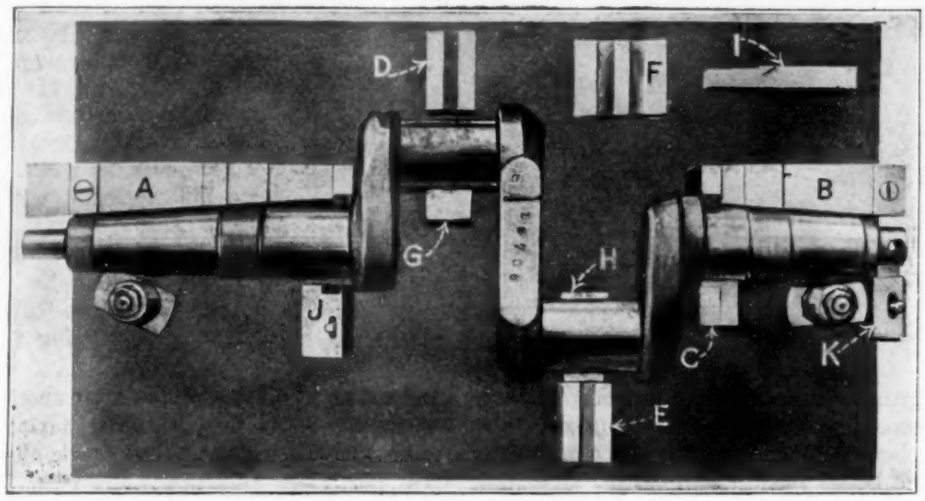
FIG. 50. DRILLING OPERATION ON STEEL FRAME

FIG. 55. TESTING CLIMBING ABILITY

AUTOMOTIVE CONSTRUCTION

snow yesterday afternoon. The rear wheels spun around but no progress could be made. An appeal for help to the factory brought out a 75-hp. tractor and two 16-ton 'Caterpillar' trailers. Over the top of the light snow went the heavy, unwieldy - looking machinery, packing it down only slightly. The Packards were unloaded and their loads put in the trailers. Then the big tractor took the two trailers in tow, hitched the trucks on behind and chug-chugged its way solemnly back to the factory. 'Some tractor,' remarked a soldier who had watched the performance."

"Some tractor" is pretty nearly right, and now that their war work is finished they can go back to their regular jobs of pulling farm machinery over the fields of the world and drawing the produce to market, stopping in the meantime to act as power plants for the harvesters and threshing machines.



CRANKSHAFT INSPECTION GAGE

Crankshaft Inspection Gage

BY FRED H. COLVIN

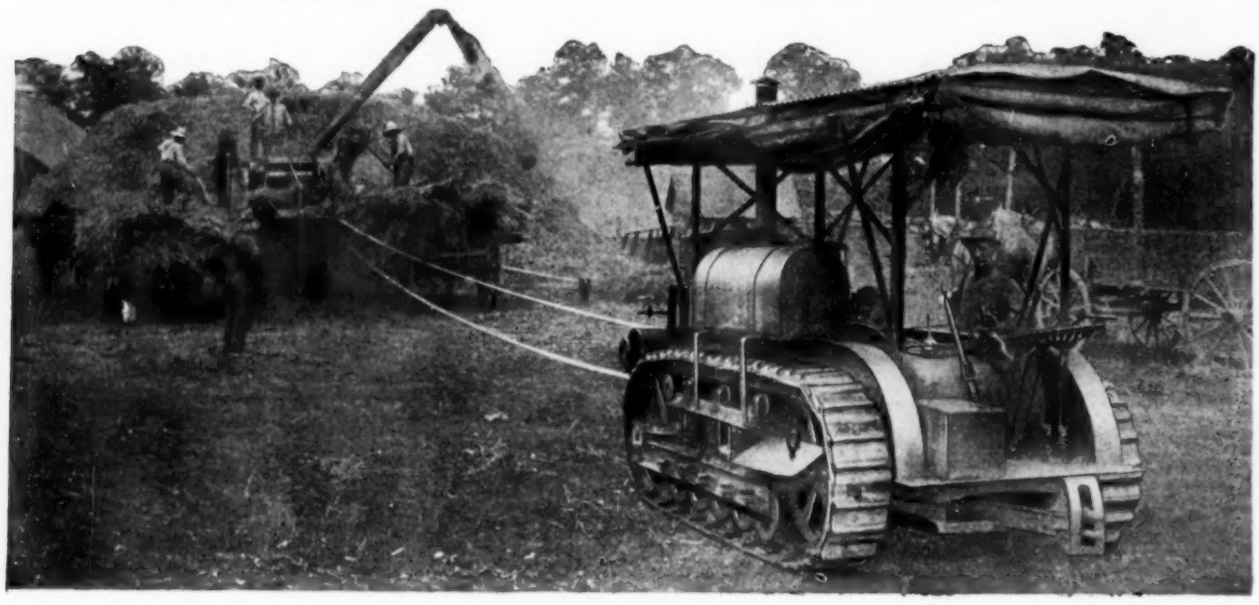
After the crankshaft has been finished and before it goes to final inspection it is placed in the gage shown in the illustration, and the general dimensions checked over by the inspector. The gage consists of the large flat plate on which are mounted supports for the crankshaft, and also blocks to be used in connection with some of the various gages. One of the supporting blocks is shown at *C* and there is a corresponding block under the outside of the corresponding crank at the other end.

The shaft is pushed up against the blocks *A* and *B*, which show the taper of the ends, the shoulders at the ends of the bearings, the length of thread, as well as the overall dimensions.

The blocks *J* and *K* are sliding gages which contact with the diameters shown, and measurement is determined by the "feel" at the end of the block. At *D* and *E* are two locating points, both of which receive the block *F*, positioning it by means of the tongue and groove shown. This block gages the length of both crankpin bearings and the radius of the fillet at the ends.

The crankpin diameters are gaged by means of the bar *I*, which has three checks, as will be noted. This bar is slid under the crankpin at either *G* or *H*, and determines the high or low limits and the permissible diameter in each case. The position of the bar shows whether it is a high- or low-limit crankpin, and in the same way rejects those which are either too large or too small, or otherwise unsuited.

Taken all together, this forms a very complete gage of simple design, and has been found very satisfactory for the work it was designed to perform.



Contracts and Contractual Relations—III

BY CHESLA C. SHERLOCK

Legality is certainly an important element of contracts. Never from the earliest times has the law enforced or upheld contracts which were illegal. While parties may consent to a thing, it must be remembered that a contract derives its force from the sanction of the law and not from the consent of the parties.

(Part II ended in our Jan. 29, 1920 issue.)

IF THE parties to a contract were permitted to set up their consent as being the controlling element, they would be enabled to defeat the whole purpose of the law. They could, by the medium of an agreement, commit offenses against the law which would not be tolerated under other circumstances.

In a Federal case, it was pointed out that the whole doctrine relating to illegal contracts was founded upon a regard for the public welfare. It has come to be recognized by the courts that a fundamental principle of the law of contracts is that a contract, in order to be valid, must have a lawful purpose, and that any transaction in violation of the law cannot be made the subject matter of a valid contract.

Very often the illegal feature of the contract is the consideration, but nine times out of ten the matter to which the courts object is the end to be accomplished by the contract. If that end is illegal or contrary to the law of the land, no matter how reasonable the other provisions of the contract may be, it will not be enforced by the courts.

What Constitutes an Illegal Contract

It should be remembered, however, that the intention of the parties has a great deal to do with the legality of the contract, as it does in other phases of contract making. While the law will not construe a contract unlawful merely because some third party may make an unlawful use of the subject matter of the contract, still, where the intention of the parties is clearly to contravene some statute in fraud of the public, the contract will be deemed vicious and without effect.

In Michigan it has been said that agreements which are lawful in themselves, but which are merely steps in accomplishing an unlawful end, will not be enforced as being against public policy. And in Florida it has been said that if the effect of the contract is to reach an unlawful end, that it will be declared unlawful regardless of the actual intention of the parties. The law will no more permit the parties to blunder into a violation than it will permit them to achieve that purpose through design and planning.

The courts have attempted to state concisely just what contracts were illegal, and the result of an examination of the leading decisions shows that a contract is illegal when it is contrary to law, morality or public policy.

A valid contract may be entered into, but if it cannot be performed without violating the law, it is null and void whether the parties knew the law or not at the time they entered into the agreement.

It has been said that where a contract can be performed in both a legal manner and in an illegal manner that it will not be declared void, because the law will not impute bad motives to any man where fair and honest intentions are sufficient to account for his conduct.

And in Tennessee it was announced, as a rule, that where a contract can be performed in a lawful manner, it will not be declared void merely because it was performed in an illegal manner, but where a contract is entered into with an intent to violate the law, it is illegal, even though the parties in performing it may actually depart from it sufficiently so as not to transgress the law.

It is also well to bear in mind that there is a distinction in the degree of intent necessary to defeat a contract. The mere fact that one of the parties intended to perform the contract in an illegal manner will not operate to render it void. The illegal intent must have been the common purpose of both parties to the agreement. And it has been said in both Iowa and Montana that the mere fact that one party was actuated by evil motives while the other was blameless will not permit the first party to escape liability in an action brought by the latter for breach of its terms.

Example of Illegal Contracts

As to the manner in which the contract may be illegal, there are a number of common instances which should be within the experience of every person who has had much to do with contracts.

In the first place, we have contracts which are in violation of statutes. If the contract seeks to achieve a purpose which is clearly within the prohibition of the statute, it is absolutely void from the beginning. The statute itself is the best evidence of what the legislaure was intending to do, and if the contract is clearly in violation of the prohibitions set down by the statute, it cannot survive before the courts.

Then, again, we have contracts which are in opposition to public policy. This often amounts to a vague term, and even the courts have not successfully defined just what is meant by public policy. However, the definition given by an English jurist many years ago has been looked upon with favor by many of the authorities. He stated it to be the principle which declares that no man will be permitted lawfully to do that which has a tendency to be injurious to the public welfare. In New Jersey it has been pointed out that public policy is constantly changing with new laws and that it will constantly require a new application of old principles.

Contracts involving a wrongful act or omission are generally held to be illegal. Among this class of contracts would be those aiding a public enemy, inducing the commission of a crime, an immoral act, inducing a breach of trust or confidence, or in fraud, or relating to negligence, generally.

Contracts affecting the public service are generally looked upon as illegal; that is, if one attempts to contract with a public official in regard to his duties in any way. It has been said that a public officer cannot enter into a contract to perform his duty, because he is already required by law to do that; and that he cannot enter into a contract to refain from performing his duty, because he is prohibited from doing that. Such a contract is null and void from the beginning and is of no effect whatever.

The same may be said in regard to contracts which

affect or interfere with the administration of justice. This not only looks to tampering with judges and jury, but also where an attempt is made to conceal evidence or testimony, interference with justice or the enforcement of the law, concealment of crime, or attempting to procure a mitigation of the punishment or a pardon.

Gambling Contracts

Gambling or wagering contracts, if not prohibited by statute, are generally held to be contrary to public policy and will not be enforced. The contract probably is good so long as it is voluntarily carried out by the parties themselves, but the courts will never attempt to adjust rights between parties to a wagering contract. It will leave them where it found them, just as soon as the wagering character of the agreement is apparent.

Contracts in regard to the marital relation, while probably not illegal in every instance, are frowned upon by the courts and in most instances are found to be illegal.

Contracts in restraint of trade have already been considered at some length in these columns. They fall under the class of contracts ordinarily held to be illegal by the courts.

Contracts to suppress bidding at a sale or auction are not looked upon with favor by the courts. To suppress bidding at a public sale is a fraud on the public as well as it is at a private sale, and an agreement in regard to bidding for public work is so vicious that it can never hope to receive any consideration at the hands of the courts.

Contracts may be illegal in part and legal in the remainder of their provisions. While there is a disagreement among the authorities as to whether a contract illegal in part is unenforceable in whole, it seems to be generally conceded that if a contract illegal in part and legal in the remainder can be severed into its legal and illegal portions that it will be enforced as to the part that is legal and ignored as to its illegal portions. But if it is so interwoven as to be incapable of severance, it is void as to the whole.

It is a general rule of law that no action can be based upon an illegal contract, and such a contract cannot be enforced by one party against another. The effect of illegality in contracts is generally as to enforceability.

While the interpretation of contracts is largely controlled by purely technical considerations at the hands of the courts, it is well for business men to know something about these considerations in order that they might know what will happen to the contracts which they chance to enter into.

In fact, the most important thing to know about a contract is to know what the courts will do to it if they have an opportunity to consider it. A learned judge of my acquaintance once said that he had never seen a contract that he could not drive a team of horses through. But we are either not all as brilliant as my friend or else the disposition of the courts is changing, for no such theory holds true in the recent decisions of the courts.

In the interpretation of contracts, the courts will first attempt to ascertain the intention of the parties, and, having done that, they will apply the remedy in the direction that it should be applied. It must be remembered that the courts will not ask the parties what their intention was, but that it will look to the contract itself for evidence of that intention.

It is obligatory, then, for the parties to exert care and caution in drawing up their agreement, and be sure that it clearly expresses their intention and agreement. Do not leave several items out and have them understood between yourselves, for if the matter ever comes to court only those items entered in the written instrument will be considered. And to have the contract exactly express the intention of the parties should be the goal of every contract maker.

The court will look to the nature, the subject matter and the purpose of the contract. It will examine the consideration and it will be controlled by the principles which we have already discussed in this series of articles.

Where it is possible for the courts, due to an uncertain expression of the intention of the parties to the contract, to give it a construction which would show it to be illegal as well as a construction to show it to be legal, the courts will construe the contract as being legal and valid, for it will never impute a bad intention to the parties. There is a presumption that, other things being equal, the parties intended to do the right thing.

In Illinois, Pennsylvania, Vermont and Wisconsin it has been said that the contract must receive a reasonable interpretation, according to the intention of the parties at the time of executing it, if that intention can be ascertained from their language. So the courts will not put an unreasonable construction on the contract, unless it is so ambiguous as to be impossible for the court to reasonably discover the intention of the parties.

Language Subject to Natural Construction

The language of the contract largely controls and it will be interpreted according to its usual meaning as used in the community. Words capable of two or three constructions will not be given an unnatural construction, but a natural construction according to the common usage in the locality or in the trade in which the parties are engaged, or to their relation to the subject matter of the contract.

If, from the acts of the parties, it is possible to determine what construction the parties themselves have given to the contract, the courts will generally follow that construction, for the parties are presumed to know more about the purpose of the agreement than anyone else.

The courts generally are given the opportunity to examine contracts through the efforts of the parties, or one of them to secure some relief.

The usual remedies for breach of contract are either for an action of damages in a law court or for specific performance in a court of equity.

In case of an action for damages, the party injured seeks to recover from the other party the value of the damage which has been done by reason of the failure of such party to perform his agreement as expressed in the contract. Oftentimes the amount of the damage is expressly agreed upon in advance in the contract by the parties. Then, again, it is a matter entirely for the court and jury to determine.

In case of specific performance the aggrieved party does not seek damages, but he seeks to compel the other party to perform his portion of the agreement. The contract may be of such a nature that damages would never compensate him if the other party fails to carry out his agreement.

While the remedies sought in the two cases must of necessity come up in different courts, they will not apply different rules of construction or interpretation to the contracts, but will be largely governed by the same rules.

It is true that the courts will never permit the introduction of parol testimony to vary the terms of a written contract, but in certain instances they will take parol testimony in order to reform the terms of the written instrument, so as to make it express the actual intention of the parties.

For instance, if the parties find that the written contract which they have signed does not express their actual intention at the time, they can apply to a court of equity to reform the contract so as to make it express their intention. The parties may agree that it did not express the intention, but disagree as to what that intention was. It is then a matter for the court to decide.

Keep in mind at all times that it is the "meeting of the minds" of the parties that controls and their intention at the time. If the written instrument fails to express the agreement, it is not a true expression of that agreement. So oral testimony does not here change the terms of a written contract, but merely changes it to express the contract correctly. The written instrument is not the contract, anyway, and never was. It is only evidence of the contract.

If business men will keep these pointers in mind when they are about their daily business, it should serve to give them a better understanding of the contract relation.

Weight Chart for Bar Stock Articles

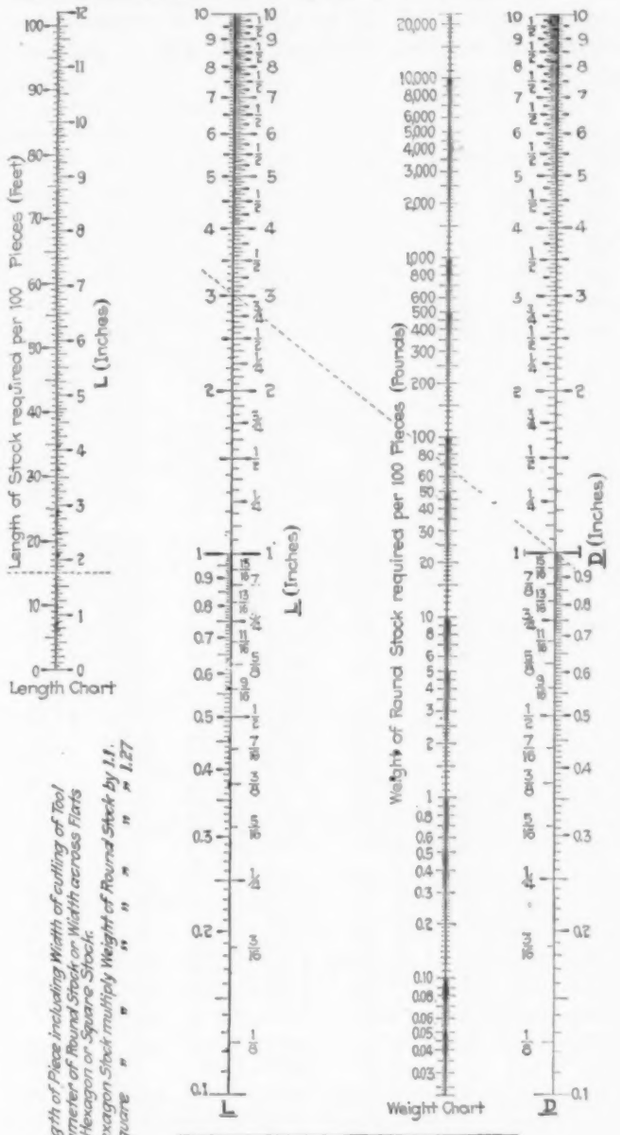
BY HANS ERNST

When making drawings of parts manufactured in large quantities from bar stock, it is customary to specify on the drawing the weight of stock required to make 100 pieces. Where a large number of such drawings are made, this causes much extra work for the draftsmen and considerable worry for the checker on account of the frequent errors. To eliminate much of this, the accompanying chart was designed and a copy given to each draftsman. The method of using the chart is as follows:

Find on the scale *D* the point representing the diameter of the stock from which the piece is made, and on the scale *L*, the length of the piece plus the width of cutting-off tool used; connect these points by a straight line and, where this line crosses weight chart, read the weight of steel bar stock required to produce 100 pieces. The example illustrated on the chart is for a piece 2⅞ in. long, requiring stock 1-in. diameter, the cutting-off tool used being ⅛ in. wide. The length of piece plus the width of cutting-off tool therefore equals 3 in., and the straight line joining 3 in. on the *L* scale with 1 in. on the *D* scale crosses the weight scale at 68; consequently, the weight of stock required to produce 100 of these pieces is 68 pounds.

Weights thus obtained from the chart include an allowance of 2 per cent for waste. The chart is designed for steel, but the weight for any other material may be determined by multiplying the weight obtained from the chart by the factor for the desired material as given in the table, this factor being the ratio of the specific gravity of that material to the specific gravity of steel.

If desired, the chart may be arranged to give the weight directly for any of the above materials or sections by moving the weight scale up or down accordingly. The small chart to the left of the *L* chart gives the length of stock required to produce 100 pieces, and is useful when determining the weight of sections other than circular, square or hexagonal. For example: if the length of the piece, including the cutter, is 1¾ in., the length of stock to make 100 pieces is 15 ft.


Length of Stock required per 100 Pieces (Feet)
L (Inches)
Length Chart
L (Inches)
Weight of Round Stock required per 100 Pieces (Pounds)
D (Inches)
L
Weight Chart
D
L = Length of Piece including Width of cutting of Tool
D = Diameter of Round Stock or Width across Flats
of Hexagon or Square Stock
For Hexagon Stock multiply Weight of Round Stock by 1.1.
" Square " " " " " 1.27

DIAMETER OF STOCK	WIDTH OF CUTTING OFF TOOL
Less than ½" Diam.	1/16" (0.063)
½" Diam. to 1 15/16" Diam.	3/32" (0.094)
1" " " 1 7/16" "	⅛" (0.125)
1½" " " 1 15/16" "	5/32" (0.156)
2" " and larger	3/16" (0.188)

CHART FOR DETERMINING LENGTH AND WEIGHT OF ROUND STOCK

RATIOS OF WEIGHTS OF METALS TO STEEL

Material	Cast Iron	Wrought Iron	Yellow Brass	Phosphor Bronze	Tobin Bronze	Monel Metal	Copper	Aluminum
Factor	0.90	0.98	1.06	1.13	1.07	1.13	1.12	0.34

For hexagonal stock multiply weight of round stock by 1.1.
For square stock multiply weight of round stock by 1.27.

The chart has now been in constant use here for over 18 months and has resulted in a very considerable saving of time, relieving the draftsmen and checker from much tedious calculating and has practically eliminated errors arising from this source. It is now being adopted in other factories.

A Table of Porcelain Shrinkage Equivalents

By L. M. CASE

The accompanying table gives the equivalent of dimensions from 0.001 in. to 1.000 in. by thousandths, based on an assumed shrinkage of 0.1406 in. per inch for porcelain products. It is presented as a valuable aid in making the calculations for the design of all sorts of clay-working tools.

SHRINKAGE EQUIVALENTS

From 0.001 inch to 1.000 inch — 1.000 inch to 6 inches

1.1406 inches = 1.000 inch

Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired size	Equivalent	Fired Size	Equivalent
0.001	0.0011	0.091	0.1037	0.181	0.2064	0.271	0.3091	0.361	0.4117	0.451	0.5144	0.541	0.6170	0.631	0.7197
0.002	0.0022	0.092	0.1049	0.182	0.2075	0.272	0.3102	0.362	0.4128	0.452	0.5155	0.542	0.6182	0.632	0.7208
0.003	0.0034	0.093	0.1060	0.183	0.2087	0.273	0.3113	0.363	0.4140	0.453	0.5166	0.543	0.6193	0.633	0.7219
0.004	0.0045	0.094	0.1072	0.184	0.2098	0.274	0.3125	0.364	0.4151	0.454	0.5178	0.544	0.6204	0.634	0.7231
0.005	0.0057	0.095	0.1083	0.185	0.2110	0.275	0.3136	0.365	0.4163	0.455	0.5189	0.545	0.6216	0.635	0.7242
0.006	0.0068	0.096	0.1094	0.186	0.2121	0.276	0.3148	0.366	0.4174	0.456	0.5201	0.546	0.6227	0.636	0.7254
0.007	0.0079	0.097	0.1106	0.187	0.2132	0.277	0.3159	0.367	0.4185	0.457	0.5212	0.547	0.6239	0.637	0.7265
0.008	0.0091	0.098	0.1117	0.188	0.2144	0.278	0.3170	0.368	0.4197	0.458	0.5223	0.548	0.6250	0.638	0.7277
0.009	0.0102	0.099	0.1129	0.189	0.2155	0.279	0.3182	0.369	0.4208	0.459	0.5235	0.549	0.6261	0.639	0.7288
0.010	0.0114	0.100	0.1140	0.190	0.2167	0.280	0.3193	0.370	0.4220	0.460	0.5246	0.550	0.6273	0.640	0.7299
0.011	0.0125	0.101	0.1152	0.191	0.2178	0.281	0.3205	0.371	0.4231	0.461	0.5258	0.551	0.6284	0.641	0.7311
0.012	0.0136	0.102	0.1163	0.192	0.2189	0.282	0.3216	0.372	0.4243	0.462	0.5269	0.552	0.6296	0.642	0.7322
0.013	0.0148	0.103	0.1174	0.193	0.2201	0.283	0.3227	0.373	0.4254	0.463	0.5280	0.553	0.6307	0.643	0.7334
0.014	0.0159	0.104	0.1186	0.194	0.2212	0.284	0.3239	0.374	0.4265	0.464	0.5292	0.554	0.6318	0.644	0.7345
0.015	0.0171	0.105	0.1197	0.195	0.2224	0.285	0.3250	0.375	0.4277	0.465	0.5303	0.555	0.6330	0.645	0.7356
0.016	0.0182	0.106	0.1209	0.196	0.2235	0.286	0.3262	0.376	0.4288	0.466	0.5315	0.556	0.6341	0.646	0.7368
0.017	0.0193	0.107	0.1220	0.197	0.2246	0.287	0.3273	0.377	0.4300	0.467	0.5326	0.557	0.6353	0.647	0.7379
0.018	0.0205	0.108	0.1231	0.198	0.2258	0.288	0.3284	0.378	0.4311	0.468	0.5338	0.558	0.6364	0.648	0.7391
0.019	0.0216	0.109	0.1243	0.199	0.2269	0.289	0.3296	0.379	0.4322	0.469	0.5349	0.559	0.6375	0.649	0.7402
0.020	0.0228	0.110	0.1254	0.200	0.2281	0.290	0.3307	0.380	0.4334	0.470	0.5360	0.560	0.6387	0.650	0.7413
0.021	0.0239	0.111	0.1266	0.201	0.2292	0.291	0.3319	0.381	0.4345	0.471	0.5372	0.561	0.6398	0.651	0.7425
0.022	0.0250	0.112	0.1277	0.202	0.2304	0.292	0.3330	0.382	0.4357	0.472	0.5383	0.562	0.6410	0.652	0.7436
0.023	0.0262	0.113	0.1288	0.203	0.2315	0.293	0.3341	0.383	0.4368	0.473	0.5395	0.563	0.6421	0.653	0.7448
0.024	0.0273	0.114	0.1300	0.204	0.2326	0.294	0.3353	0.384	0.4379	0.474	0.5406	0.564	0.6432	0.654	0.7459
0.025	0.0285	0.115	0.1311	0.205	0.2338	0.295	0.3364	0.385	0.4391	0.475	0.5417	0.565	0.6444	0.655	0.7470
0.026	0.0296	0.116	0.1323	0.206	0.2349	0.296	0.3376	0.386	0.4402	0.476	0.5429	0.566	0.6455	0.656	0.7482
0.027	0.0307	0.117	0.1334	0.207	0.2361	0.297	0.3387	0.387	0.4414	0.477	0.5440	0.567	0.6467	0.657	0.7493
0.028	0.0319	0.118	0.1345	0.208	0.2372	0.298	0.3398	0.388	0.4425	0.478	0.5452	0.568	0.6478	0.658	0.7505
0.029	0.0330	0.119	0.1357	0.209	0.2384	0.299	0.3410	0.389	0.4436	0.479	0.5463	0.569	0.6490	0.659	0.7516
0.030	0.0342	0.120	0.1368	0.210	0.2395	0.300	0.3421	0.390	0.4448	0.480	0.5475	0.570	0.6501	0.660	0.7527
0.031	0.0353	0.121	0.1380	0.211	0.2407	0.301	0.3433	0.391	0.4459	0.481	0.5486	0.571	0.6512	0.661	0.7539
0.032	0.0364	0.122	0.1391	0.212	0.2418	0.302	0.3444	0.392	0.4471	0.482	0.5497	0.572	0.6524	0.662	0.7550
0.033	0.0376	0.123	0.1402	0.213	0.2429	0.303	0.3456	0.393	0.4482	0.483	0.5509	0.573	0.6535	0.663	0.7562
0.034	0.0387	0.124	0.1414	0.214	0.2441	0.304	0.3467	0.394	0.4493	0.484	0.5520	0.574	0.6547	0.664	0.7573
0.035	0.0399	0.125	0.1425	0.215	0.2452	0.305	0.3478	0.395	0.4505	0.485	0.5531	0.575	0.6558	0.665	0.7584
0.036	0.0410	0.126	0.1437	0.216	0.2464	0.306	0.3490	0.396	0.4516	0.486	0.5543	0.576	0.6569	0.666	0.7596
0.037	0.0422	0.127	0.1448	0.217	0.2475	0.307	0.3501	0.397	0.4528	0.487	0.5554	0.577	0.6581	0.667	0.7607
0.038	0.0433	0.128	0.1459	0.218	0.2486	0.308	0.3513	0.398	0.4539	0.488	0.5566	0.578	0.6592	0.668	0.7619
0.039	0.0444	0.129	0.1471	0.219	0.2498	0.309	0.3524	0.399	0.4550	0.489	0.5577	0.579	0.6604	0.669	0.7630
0.040	0.0456	0.130	0.1482	0.220	0.2509	0.310	0.3535	0.400	0.4562	0.490	0.5588	0.580	0.6616	0.670	0.7642
0.041	0.0467	0.131	0.1494	0.221	0.2521	0.311	0.3547	0.401	0.4573	0.491	0.5600	0.581	0.6626	0.671	0.7653
0.042	0.0479	0.132	0.1505	0.222	0.2532	0.312	0.3558	0.402	0.4585	0.492	0.5611	0.582	0.6638	0.672	0.7664
0.043	0.0490	0.133	0.1516	0.223	0.2543	0.313	0.3570	0.403	0.4596	0.493	0.5623	0.583	0.6649	0.673	0.7676
0.044	0.0501	0.134	0.1528	0.224	0.2555	0.314	0.3581	0.404	0.4608	0.494	0.5634	0.584	0.6661	0.674	0.7687
0.045	0.0513	0.135	0.1539	0.225	0.2566	0.315	0.3592	0.405	0.4619	0.495	0.5645	0.585	0.6672	0.675	0.7699
0.046	0.0524	0.136	0.1551	0.226	0.2578	0.316	0.3604	0.406	0.4630	0.496	0.5657	0.586	0.6683	0.676	0.7710
0.047	0.0536	0.137	0.1562	0.227	0.2589	0.317	0.3615	0.407	0.4642	0.497	0.5668	0.587	0.6695	0.677	0.7721
0.048	0.0547	0.138	0.1574	0.228	0.2600	0.318	0.3627	0.408	0.4653	0.498	0.5680	0.588	0.6706	0.678	0.7733
0.049	0.0558	0.139	0.1585	0.229	0.2612	0.319	0.3638	0.409	0.4665	0.499	0.5691	0.589	0.6718	0.679	0.7744
0.050	0.0570	0.140	0.1596	0.230	0.2623	0.320	0.3649	0.410	0.4676	0.500	0.5703	0.590	0.6729	0.680	0.7756
0.051	0.0581	0.141	0.1608	0.231	0.2634	0.321	0.3661	0.411	0.4687	0.501	0.5714	0.591	0.6740	0.681	0.7767
0.052	0.0593	0.142	0.1619	0.232	0.2645	0.322	0.3672	0.412	0.4699	0.502	0.5726	0.592	0.6752	0.682	0.7778
0.053	0.0604	0.143	0.1631	0.233	0.2657	0.323	0.3684	0.413	0.4710	0.503	0.5737	0.593	0.6763	0.683	0.7790
0.054	0.0615	0.144	0.1642	0.234	0.2668	0.324	0.3695	0.414	0.4722	0.504	0.5748	0.594	0.6775	0.684	0.7801
0.055	0.0627	0.145	0.1653	0.235	0.2679	0.325	0.3706	0.415	0.4733	0.505	0.5760	0.595	0.6786	0.685	0.7813
0.056	0.0638	0.146	0.1665	0.236	0.2690	0.326	0.3718	0.416	0.4744	0.506	0.5771	0.596	0.6797	0.686	0.7824
0.057	0.0650	0.147	0.1676	0.237	0.2702	0.327	0.3729	0.417	0.4756	0.507	0.5782	0.597	0.6809	0.687	0.7835
0.058	0.0661	0.148	0.1688	0.238	0.2713	0.328	0.3741	0.418	0.4767	0.508	0.5794	0.598	0.6820	0.688	0.7847
0.059	0.0672	0.149	0.1699	0.239	0.2725	0.329	0.3752	0.419	0.4779	0.509	0.5805	0.599	0.6832	0.689	0.7858
0.060	0.0684	0.150	0.1710	0.240	0.2737	0.330	0.3763	0.420	0.4790	0.510	0.5817	0.600	0.6843	0.690	0.7870
0.061	0.0695	0.151	0.1722	0.241	0.2748	0.331	0.3775	0.421	0.4801	0.511	0.5828	0.601	0.6855	0.691	0.7881
0.062	0.0707	0.152	0.1733	0.242	0.2760	0.332	0.3786	0.422	0.4813	0.512	0.5839	0.602	0.6866	0.692	0.7892
0.063	0.0718	0.153	0.1745	0.243	0.2771	0.333	0.3798	0.423	0.4824	0.513	0.5851	0.603	0.6877	0.693	0.7904
0.064	0.0729	0.154	0.1756	0.244	0.2783	0.334	0.3809	0.424	0.4836	0.514	0.5862	0.604	0.6889	0.694	0.7915
0.065	0.0741	0.155	0.1767	0.245	0.2794	0.335	0.3821	0.425	0.4847	0.515	0.5874	0.605	0.6900	0.695	0.7927
0.066	0.0752	0.156	0.1779	0.246	0.2805	0.336	0.3832	0.426	0.4858	0.516	0.5885	0.606	0.6912	0.696	0.7938
0.067	0.0764	0.157	0.1790	0.247	0.2817	0.337	0.3843	0.427	0.4870	0.517	0.5896	0.607	0.6923	0.697	0.7949
0.068	0.0775	0.158	0.1802	0.248	0.2828	0.338	0.3855	0.428	0.4881	0.518	0.5908	0.608	0.6934	0.698	0.7961
0.069	0.0787	0.159	0.1813	0.249	0.2840	0.339	0.3866	0.429	0.4893	0.519	0.5919	0.609	0.6946	0.699	0.7972
0.070	0.0798	0.160	0.1824	0.250	0.2851	0.340	0.3878	0.430	0.4904	0.520	0.5931	0.610	0.6957	0.700	0.7984
0.071	0.0809	0.161	0.1836	0.251	0.2862	0.341	0.3889	0.431	0.4915	0.521	0.5942	0.611	0.6969	0.701	0.7995
0.072	0.0821	0.162	0.1847	0.252	0.2874	0.342	0.3900	0.432	0.4927	0.522	0.5953	0.612	0.6980	0.702	0.8007
0.073	0.0832	0.163	0.1859	0.253	0.2885	0.343	0.3912	0.433	0.4938	0.523	0.5965	0.613	0.6991	0.703	0.8018
0.074	0.0844	0.164	0.1870	0.254	0.2897	0.344	0.3923	0.434	0.4950	0.524	0.5976	0.614	0.7003	0.704	0.8029
0.075	0.0855	0.165	0.1881	0.255	0.2908	0.345	0.3935	0.435	0.4961	0.525	0.5988	0.615	0.7014	0.705	0.8041
0.076	0.0866	0.166	0.1893	0.256	0.2919	0.346	0.3946	0.436	0.4973	0.526	0.5999	0.616	0.7026	0.706	0.8052
0.077	0.0878	0.167	0.1904	0.257	0.2931	0.347	0.3957	0.437	0.4984	0.527	0.6010	0.617	0.7037	0.707	0.8064
0.078	0.0889	0.168	0.1916	0.258	0.2942	0.348	0.3969	0.438	0.4995	0.528	0.6022	0.618	0.7048	0.708	0.8075
0.079	0.0901	0.169	0.1927	0.259	0.2954	0.349	0.3980	0.439	0.5007	0.529	0.6033	0.619	0.7060	0.709	0.8086
0.080	0.0912	0.170	0.1939	0.260	0.2965	0.350	0.3992	0.440	0.5018	0.530	0.6045	0.620	0.7071	0.710	0.8098
0.081	0.0923	0.171	0.1950	0.261	0.2976	0.351	0.4003	0.441	0.5030	0.531	0.6056	0.621	0.7083	0.711	0.8109
0.082	0.0935	0.172	0.1961	0.262	0.2988	0.352	0.4014	0.442	0.5041	0.532	0.6067	0.622	0.7094	0.712	0.8121
0.083	0.0946	0.173	0.1973	0.263	0.2999	0.353	0.4026	0.443	0.5052	0.533	0.6079	0.623	0.7105	0.713	0.8132
0.084	0.0958	0.174	0.1984	0.264	0.3011	0.354	0.4037	0.444	0.5064	0.534	0.6090	0.624	0.7117	0.714	0.8143
0.085	0.0969	0.175	0.1996	0.265	0.3022	0.355	0.4049	0.445	0.5075	0.535	0.6102	0.625	0.7128	0.715	0.8155
0.086	0.0980	0.176	0.2007	0.266	0.3033	0.356	0.4060	0.446	0.5087	0.536	0.6113	0.626	0.7140	0.716	0.8166
0.087	0.0992	0.177	0.2018	0.267	0.3045	0.357	0.4071	0.447	0.5098	0.537	0.6125	0.627	0.7151	0.717	0.8178
0.088	0.1003	0.178	0.2030	0.268	0.3056	0.358	0.4083	0.448	0.5109	0.538	0.6136	0.628	0.7162	0.718	0.8189
0.089	0.1015	0.179	0.2041	0.269	0.3068	0.359	0.4094	0.449	0.5121	0.539	0.6147	0.629	0.7174	0.719	0.8200
0.090	0.1026	0.180	0.2053	0.270	0.3079	0.360	0.4106	0.450	0.5132	0.540	0.6159	0.630	0.7185	0.720	0.8212

SHRINKAGE EQUIVALENTS—Continued

From 0.001 inch to 1.000 inch — 1.000 inch to 6 inches

1.1406 inches = 1.000 inch

Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent	Fired Size	Equivalent
0.721	0.8223	0.758	0.8645	0.794	0.9056	0.831	0.9478	0.868	0.9900	0.904	1.0311	0.941	1.0733	0.978	1.1155
0.722	0.8235	0.759	0.8657	0.795	0.9067	0.832	0.9489	0.869	0.9911	0.905	1.0322	0.942	1.0744	0.979	1.1166
0.723	0.8246	0.760	0.8668	0.796	0.9079	0.833	0.9501	0.870	0.9923	0.906	1.0333	0.943	1.0755	0.980	1.1177
0.724	0.8257			0.797	0.9090	0.834	0.9512			0.907	1.0345	0.944	1.0767		
0.725	0.8269	0.761	0.8679	0.798	0.9101	0.835	0.9524	0.871	0.9934	0.908	1.0356	0.945	1.0778	0.981	1.1189
0.726	0.8280	0.762	0.8691	0.799	0.9113	0.836	0.9535	0.872	0.9946	0.909	1.0368	0.946	1.0790	0.982	1.1200
0.727	0.8292	0.763	0.8702	0.800	0.9124	0.837	0.9546	0.873	0.9957	0.910	1.0379	0.947	1.0801	0.983	1.1212
0.728	0.8303	0.764	0.8714			0.838	0.9558	0.874	0.9968			0.948	1.0812	0.984	1.1223
0.729	0.8314	0.765	0.8725	0.801	0.9136	0.839	0.9569	0.875	0.9980	0.911	1.0390	0.949	1.0824	0.985	1.1234
0.730	0.8326	0.766	0.8736	0.802	0.9147	0.840	0.9581	0.876	0.9991	0.912	1.0402	0.950	1.0835	0.986	1.1246
		0.767	0.8748	0.803	0.9159			0.877	1.0003	0.913	1.0413			0.987	1.1257
0.731	0.8337	0.768	0.8759	0.804	0.9170	0.841	0.9592	0.878	1.0014	0.914	1.0425	0.951	1.0847	0.988	1.1269
0.732	0.8349	0.769	0.8771	0.805	0.9181	0.842	0.9603	0.879	1.0025	0.915	1.0436	0.952	1.0858	0.989	1.1280
0.733	0.8360	0.770	0.8782	0.806	0.9193	0.843	0.9615	0.880	1.0037	0.916	1.0447	0.953	1.0869	0.990	1.1291
0.734	0.8371			0.807	0.9204	0.844	0.9626			0.917	1.0459	0.954	1.0881		
0.735	0.8383	0.771	0.8794	0.808	0.9216	0.845	0.9638	0.881	1.0048	0.918	1.0470	0.955	1.0892	0.991	1.1303
0.736	0.8394	0.772	0.8805	0.809	0.9227	0.846	0.9649	0.882	1.0060	0.919	1.0482	0.956	1.0904	0.992	1.1314
0.737	0.8406	0.773	0.8816	0.810	0.9238	0.847	0.9660	0.883	1.0071	0.920	1.0493	0.957	1.0915	0.993	1.1326
0.738	0.8417	0.774	0.8828			0.848	0.9672	0.884	1.0082			0.958	1.0926	0.994	1.1337
0.739	0.8429	0.775	0.8839	0.811	0.9250	0.849	0.9683	0.885	1.0094	0.921	1.0504	0.959	1.0938	0.995	1.1348
0.740	0.8440	0.776	0.8851	0.812	0.9261	0.850	0.9695	0.886	1.0105	0.922	1.0516	0.960	1.0949	0.996	1.1360
		0.777	0.8862	0.813	0.9273			0.887	1.0117	0.923	1.0527			0.997	1.1371
0.741	0.8451	0.778	0.8873	0.814	0.9284	0.851	0.9706	0.888	1.0128	0.924	1.0539	0.961	1.0961	0.998	1.1383
0.742	0.8463	0.779	0.8885	0.815	0.9295	0.852	0.9717	0.889	1.0139	0.925	1.0550	0.962	1.0972	0.999	1.1394
0.743	0.8474	0.780	0.8896	0.816	0.9307	0.853	0.9729	0.890	1.0151	0.926	1.0561	0.963	1.0983	1.000	1.1406
0.744	0.8486			0.817	0.9318	0.854	0.9740			0.927	1.0573	0.964	1.0995		
0.745	0.8497	0.781	0.8908	0.818	0.9330	0.855	0.9752	0.891	1.0162	0.928	1.0584	0.965	1.1006	1.5	1.7109
0.746	0.8508	0.782	0.8919	0.819	0.9341	0.856	0.9763	0.892	1.0174	0.929	1.0596	0.966	1.1018	2.0	2.2812
0.747	0.8520	0.783	0.8930	0.820	0.9352	0.857	0.9774	0.893	1.0185	0.930	1.0607	0.967	1.1029	2.5	2.8515
0.748	0.8531	0.784	0.8942			0.858	0.9786	0.894	1.0196			0.968	1.1041	3.0	3.4218
0.749	0.8543	0.785	0.8953	0.821	0.9364	0.859	0.9797	0.895	1.0208	0.931	1.0618	0.969	1.1052	3.5	3.9922
0.750	0.8554	0.786	0.8965	0.822	0.9375	0.860	0.9809	0.896	1.0219	0.932	1.0630	0.970	1.1063	4.0	4.5624
		0.787	0.8976	0.823	0.9387			0.897	1.0231	0.933	1.0641			4.5	5.1327
0.751	0.8565	0.788	0.8987	0.824	0.9398	0.861	0.9820	0.898	1.0242	0.934	1.0653	0.971	1.1075	5.0	5.7030
0.752	0.8577	0.789	0.8999	0.825	0.9409	0.862	0.9831	0.899	1.0253	0.935	1.0664	0.972	1.1086	5.5	6.2733
0.753	0.8588	0.790	0.9010	0.826	0.9421	0.863	0.9843	0.900	1.0265	0.936	1.0676	0.973	1.1098	6.0	6.8436
0.754	0.8600			0.827	0.9432	0.864	0.9854			0.937	1.0687	0.974	1.1109		
0.755	0.8611	0.791	0.9022	0.828	0.9444	0.865	0.9866	0.901	1.0276	0.938	1.0698	0.975	1.1120		
0.756	0.8622	0.792	0.9033	0.829	0.9455	0.866	0.9877	0.902	1.0288	0.939	1.0710	0.976	1.1132		
0.757	0.8634	0.793	0.9044	0.830	0.4669	0.867	0.9889	0.903	1.0299	0.940	1.0721	0.977	1.1143		

Machine-Tool Nomenclature

BY ENTROPY

We American people are a perverse lot. We like to take liberties with the English language. Our lexicographers are from ten to twenty-five years behind us. Mr. Norton, who wishes us to adopt a new name for the machine which we have called a grinder for a generation, is about ten to twenty-five years ahead of us. What are we going to do about it? Are we going to concede that Mr. Norton, having kept pretty uniformly in the limelight in grinding circles for a long time, has thereby acquired the right to tell us what we shall call his machine and the machines made by his competitors, or are we going to follow our usual course and continue to call them whatever we please?

It, however, brings up the whole question of machine-shop nomenlature, which is a topic of long standing and little progress. We have adopted many names without much thought, and different sections of the country have adopted different names for the same thing, all of which leads to seemingly unnecessary confusion. It seems, however, hardly fair to concede the right to change names to a single person connected with a single firm which has many competitors, some of them large enough so that they may be at least as well able to present ideas as the one who is insisting on this particular name.

It hardly seems as though any body of less importance than the Machine Tool Builders' Association or the American Society of Mechanical Engineers could pass on this matter and initiate new names with anything like the authority or the prestige that is necessary to accomplish the desired result. Even then, the mere dictum of an association does not appeal to the American people. The only advantage an association has is that it can exert the power of example over a greater area than an individual. Those, in this particular case, who agree with Mr. Norton will try to remember to use the words "grinder" and "grinding machine" as he wishes. No doubt, the publicity department of his own concern feels the same way although it has slipped up at times. It is not easy to change our method of speech unless there is something catchy about the new expression. It took a long while to get even the technical papers straightened out on the distinction between a rule and a scale. Even now the two words are confused in the minds of many who are otherwise good mechanics and law-abiding citizens.

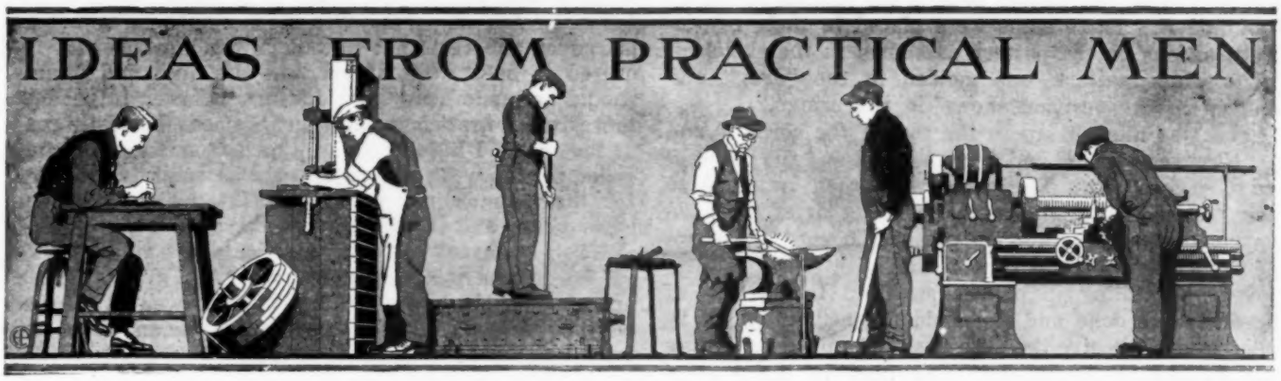
As for the particular question of nomenclature before us, why change? It is not nearly as bad as the confusion over the exact meaning of the word "typewriter" which is still used many times in reference to the typist rather than to the machine. If we were to follow that analogy, we might use the word "grinder" to represent the machine and "grindist" to represent the operator thereof. It would, however, not make the slightest difference as there is not the danger that arises when a man comes home and complains that he had to carry the typewriter across the street. His wife will never be confused as to the meaning of the word "grinder."

There is no doubt but that the expressions "grinding machine" and "grinding-machine operator" are more accurately descriptive than if we use the word "grinder" for both, but why spend time worrying about it when there are so many important things to be done, like straightening out our industrial unrest or getting into or out of the League of Nations? We like to wear ourselves out discussing these trivial and unimportant things, which when they are compared with the big things all around us make us seem small and narrow. Why not leave such matters to some committee of one of the societies and when it has approved some momenclature, wait patiently for people to follow in its wake, as they will surely do if the society has sufficient power of persuasion and keeps using the new terms in its own literature.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas

DRAFTING-ROOM KINKS

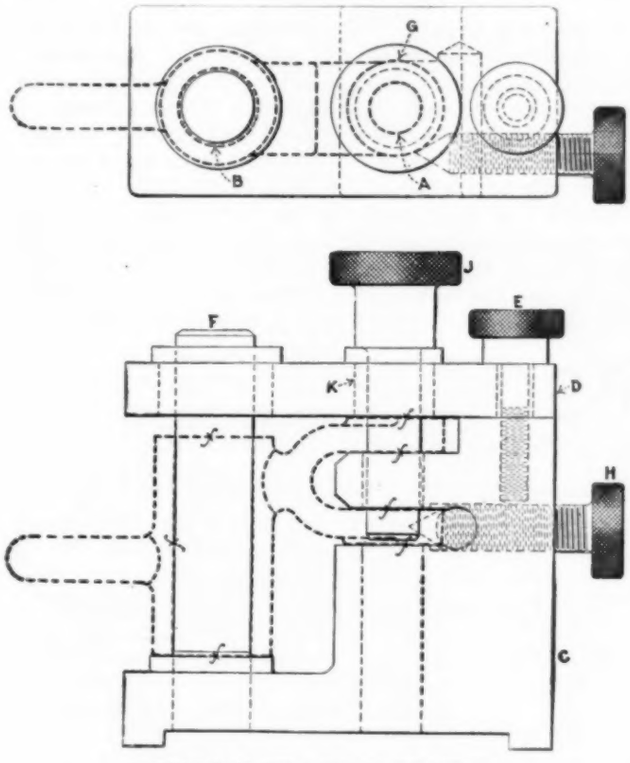


Reaming Fixture With Locating Plugs

BY H. M. FAY

The use of fixtures for reaming purposes, while not by any means common practice, is sometimes resorted to for meeting exacting requirements, and the accompanying illustration shows such a condition.

The work contains two parallel holes. All work except hand-reaming the hole *A* has been completed,



A FIXTURE FOR HAND REAMING

the hole *B* having been reamed by hand to a smooth finish and accurate size, and the hole *A* machine-reamed. The final reaming of this hole is a hand operation to correct slight inaccuracies of size, alignment and finish.

The fixture is held by the body *C* in a vise. The plate *D* is removable from the body of the fixture by taking out the thumb-screw *E*, this screw having a clearance hole for it in the plate *D*. The work is pushed over the post *F* and is located against *G* by means of the thumb-screw *H*, which has a beveled point on it for this purpose.

The plate *D* is then pushed over the post *F* and the pin *J* is pushed through the bushing in the plate and the hole *A* in the work, thereby locating the plate *D* in correct location for reaming. The thumb-screw *E* is now securely tightened in place, thus locking the plate. By removing the pin *J* the hole *A* may be hand-reamed, using bushing *K* to guide the reamer.

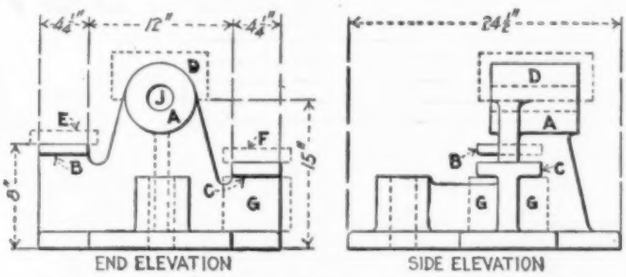
Saving Pattern Work by Using Stock Cores

BY M. E. DUGGAN

Lack of knowledge of molding methods is a serious handicap to the patternmaker who is located some distance from the foundry and who has no one with whom he can consult when a difficult job of patternmaking presents itself.

The combination piece shown in the illustration, which includes a baseplate, journal bearing and vertical brackets, is a simple job of patternmaking and molding to the patternmaker who knows foundry practice. To the man who does not understand molding methods this job is a puzzle.

The first pattern for this piece was made with cores *G* under the plates *B* and *C;* also under the journal bearing *A*. For these cores, coreboxes were made. With



THE WAY IN WHICH THE PATTERN WAS MOLDED

this method, material was wasted and unnecessary labor and time were spent in the making of the pattern; the making of the mold was contrary to good molding practice and a casting that was very unsatisfactory was produced.

The second pattern was a simple and practical job both for the patternmaker and the molder; the patternmaker made it so because he knew molding practice.

The pattern was made with the plates *B* and *C*, and also the journal bearing *A*, loose. No core prints were made on the pattern.

The pattern was sent to the foundry and when the molder was ready to proceed with the making of the mold, he first went to the coreroom and picked out two slab cores (which are usually kept in stock in all foundries) and one core large enough to make the saddle

core *D*. These he cut and filed to the shapes shown at *D*, *E* and *F*. These cores were placed in their respective positions on the pattern as shown in the sketch.

The whole pattern was molded in the "drag" and rammed in the position shown in the sketch.

Sand was filled in up to the top of the cores *E* and *F*. Next the cores *E* and *F* were lifted and the plates *B* and *C* picked out. The cores were then returned to their places in the mold and the filling in of the sand continued up to the top of the saddle core *D*, where the same operation was repeated as with *B* and *C*.

Next the filling in of the sand up to the top of the flask was done and the mold finished, ready to be rolled over to receive the cope flask. As but one casting was wanted no center core was used in the journal bearing *J*.

Standard Title, Lettering and Lines

By George W. Childs
Works Engineer, American Steel Foundries

During my years' of experience as chief draftsman and engineer in various industrial establishments, after starting a new draftsman or tracer to work, I have invariably been questioned as to the style of lettering, lines, specifications, etc., that will be required on the tracings. In order to save time and not be compelled to search the files for tracings and prints for good examples of work to follow, I have made up sheets as shown in the illustration. A good draftsman is generally well informed along these lines, but I have found some who are not, especially those among the young men who have had no particular training or instruction.

I believe if chief draftsmen in general would have sheets made up along the lines in question that they will find them very helpful as well as instructive to those in need of them.

I have shown on the sheet a form for specifications and order, also a bill of material; either of which is suitable and one or the other is generally used in industrial establishments. Too much emphasis cannot be placed on the fact that nowadays tracings are not required to be a work of art, but the lines and figures should be made heavy and distinct in order to produce therefrom a first-class blueprint that can be easily read in the shop. I have often seen men from the shop compelled to stop work and request a draftsman to interpret for them dimensions on a blueprint, which of course costs money and should not be necessary.

When I started as an apprentice draftsman over 30 years ago, tracings were made which had a very artistic appearance; shade and shadow lines as well as a brush were used, but I do not believe a draftsman would last very long on his job if he attempted to produce such work now.

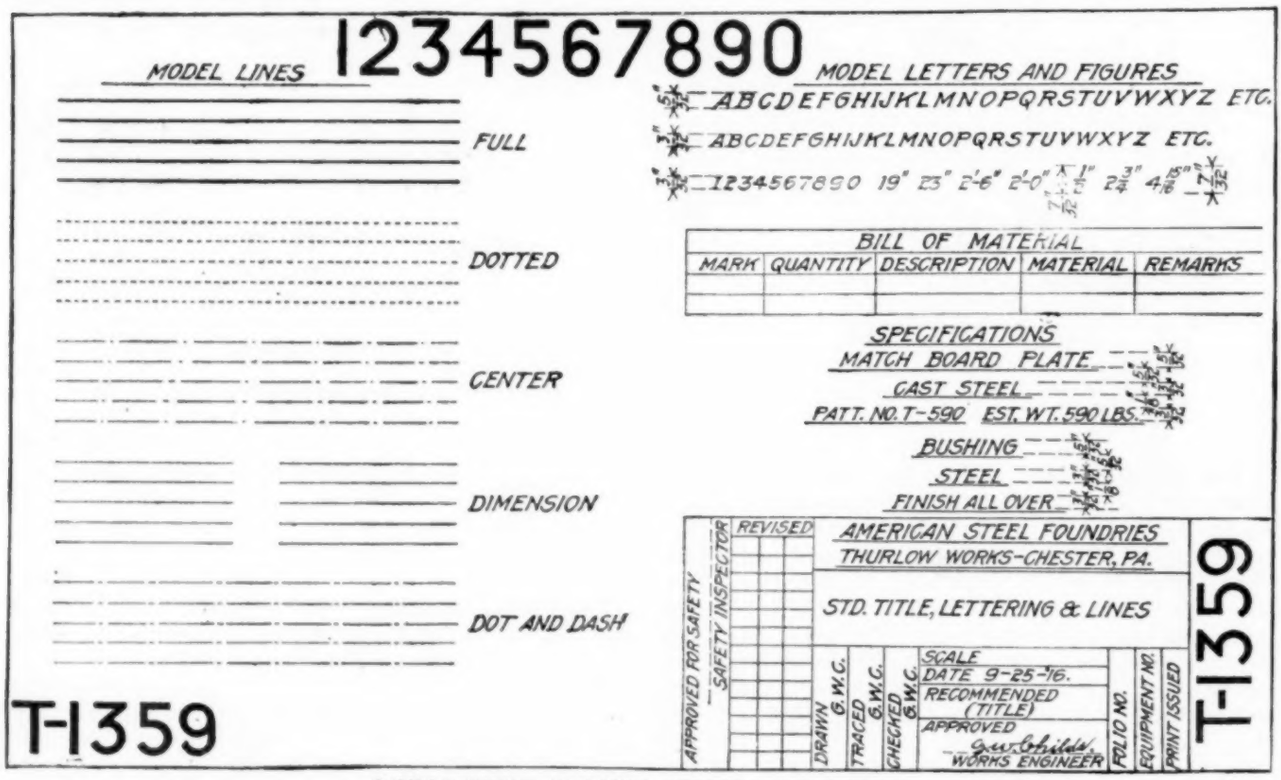
Sheets of tracing cloth can be purchased from drawing material houses with the title, form and border lines printed thereon and it will then only be necessary to fill in the necessary title of the drawing, etc., with freehand lettering.

Setting the Milling-Machine Vise in Alignment

By John A. Grill

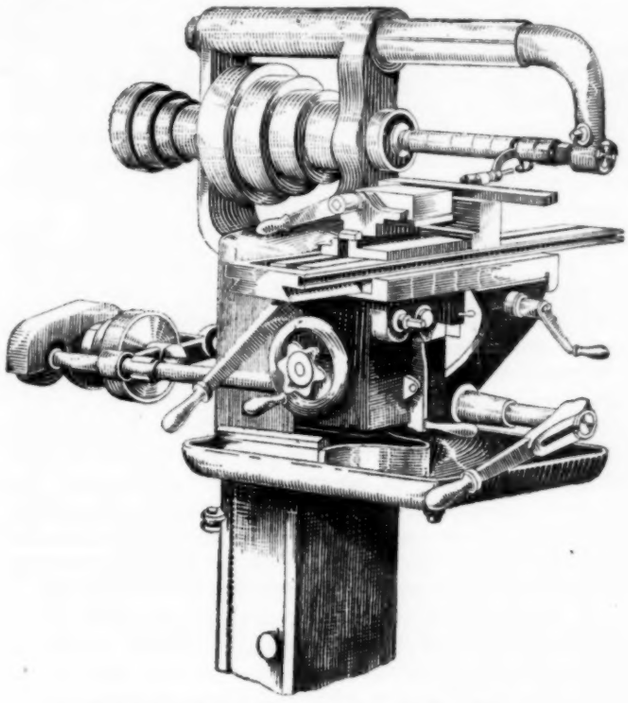
A good way to set a milling-machine vise square with, or parallel to the table is shown in the illustration. After getting the vise as nearly into alignment as is conveniently possible by ordinary means, clamp it tightly enough so that it will not be accidentally moved; but not sufficiently tight to prevent it from being moved by rapping it with a ball of lead.

Hold a 1-in. micrometer on the milling-machine arbor by clamping the bow between two collars with the barrel below the arbor and parallel to the table. The micrometer can be held quite firmly in this way without injuring it in the least if good judgment is used.



SAMPLE SHEET OF LINES, LETTERS AND TITLES

A parallel may now be clamped in the vise and tested for parallelism by moving the table forward and back, or the saddle in and out as the case may be, backing the thimble of the micrometer cut to touch the face of



SETTING THE MILLING-MACHINE VISE

the parallel at each trial and rapping the vise one way or another with the lead ball as the reading indicates until the micrometer reads alike at both ends of the parallel.

A Machine for Molding a Special Gear

BY K. J. VAN SICKLE

The illustration shows a machine for molding the double gears used on agricultural and other rough machinery.

We had heretofore experienced trouble from having these gears more or less elliptical in shape and eccentric as to centers when made from a loose pattern drawn by hand, even though an experienced molder made them. To overcome the trouble I designed a machine to be operated with one lever and be as near fool-proof as possible.

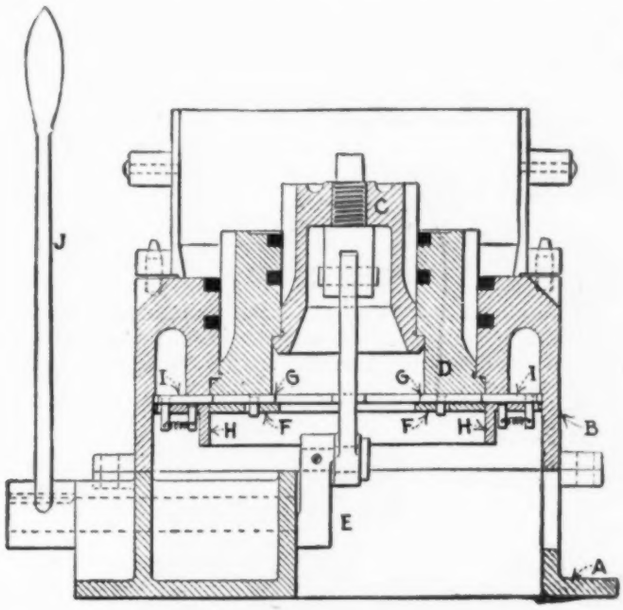
We built three machines for making three different sized gears and have used them now for over two years, with excellent results. An unskilled laborer can produce more and better gears with this machine than could a skilled man by the old method.

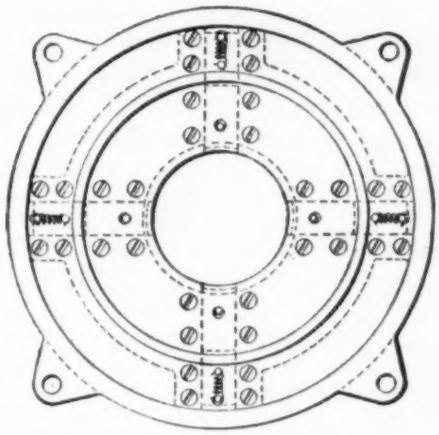
The machine is of the stripping-plate type and is composed of a base *A*, a cylinder *B*, and two gear patterns *C* and *D* operating like pistons from the crank and connecting-rod *E*. The outer cylinder is bored and counterbored to a sliding fit for the gear *D*, and the bore of the latter is a sliding fit for the gear *C*.

Two grooves in each bore serve to anchor the lead, babbitt, or other soft metal used for filling between the teeth of the gears. Before pouring the lead the gear patterns are smoked thoroughly and then placed in position. A dam is built up around each outside groove so that the metal will be cast sufficiently above the face of the cylinder and gear respectively to insure filling the teeth. The whole machine should be heated well before pouring and the metal should be very hot to avoid cold shuts.

As soon after pouring as the metal sets, the gears are pushed out by an arbor press, the smoke cleaned off and the soft metal faced off flush with the pattern.

A ring *F* with four slots milled in it to guide the slides *G*, is fastened to the larger gear by means of machine screws, and the ring *H* which has four slots





MACHINE FOR MOLDING DOUBLE GEARS

milled in it for the latches *I*, is similarly fastened to the cylinder.

To operate, the lever *J* is set in the vertical position so that the gears are in the position shown in the illustration. A flask is set on, filled and rammed up in the regular way. Then by pulling the lever *J* down, the gear *C* withdraws from the mold into the gear *D* until it forces the four slides *G* out against the four latches *I*, thereby releasing the larger gear. The smaller gear now bears on the ring *F* and thus draws the larger gear (as well as the smaller one) from the mold into the cylinder.

The drag, now completed, is lifted off, rolled over and placed upon the floor ready for the flat cope which is

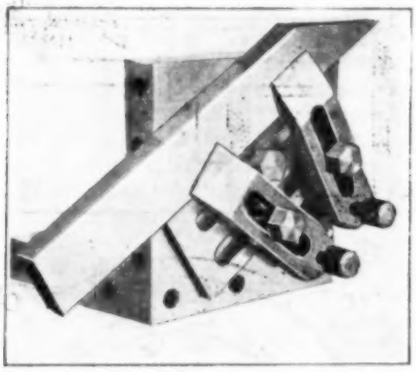
to cover it. All that is required to prepare the machine for the next mold is to raise the lever *J* to a vertical position. This movement first raises the small gear *C* until its flange reaches the shoulder in the large gear, and from that point lifts both gears together until the latches *I* snap into place. The upper edge of the flange on the large gear should be beveled as shown, so as to push back the latches and allow the shoulder to pass by. A similar bevel on the underside of the flange of the smaller gear serves the same purpose in relation to the slides *G* which are in effect but extensions of the latches *I* enabling the inner gear to reach and unlock them at the proper moment.

With this machine any man of average intelligence, when given a few instructions, can turn out better gears and in less time than a molder with years of experience can with a loose pattern. Double gears made on a machine of this kind have no draft on the teeth, and are round and concentric.

A Handy Toolroom Angle Plate

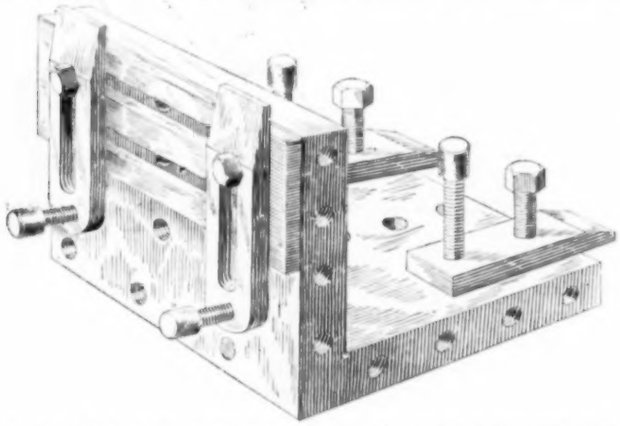
By Joe Peterson

The angle plate shown in the illustrations has come in handy for use in grinding various small pieces used in the making of jig, fixture and cutting-tool parts in the



toolroom of the R. & V. Wagner Ordnance Co., East Moline, Ill.

The angle plate is made of machine steel, carbonized, hardened and ground to square in all directions. The numerous holes tapped to ⅜ in. (16 U.S.S.) provide ample means for clamping any work that comes along.



A parallel strip which can be clamped independently facilitates duplication of set-ups. A set of short and long clamps, each provided with an elongated slot for clamping, and a support screw with knurled head, for the tail end, complete the outfit.

What Is a High-Grade Machine?

By Entropy

This seems like a perfectly simple question to answer. The trouble is that every man puts a different interpretation on the answer. A high-grade machine is a good one. Some people think a good machine is one with a high polish. Others think it is a machine of good design; in other words, such a machine as they would design. Some also think it is a machine that is as nearly accurate as human ingenuity can make it; and still others that it is the machine which will give the greatest possible product.

All of these people are right to some extent and wrong in so far as they limit their views to their one hobby.

This discussion really should not be about the machine and its degree of perfection; but about the inability of production men to see anything else, the inability of the fine mechanic to see the need of production, and so on around the whole circle. The only balanced man around a machine shop seems to be a man who knows so little of mechanics that he cannot criticize the design, the finish or the productivity of the machine, but can only discover its fitness for the work for which it is intended by the way the orders come in and the way the machines stay sold in the shops for which they were intended.

If the shop which turns out the machine is in business, not to make machines but to make money, as one well-known superintendent puts it, then the question of quality of its output depends on, and is indicated by, the measure in which one machine helps to sell another over the period of the natural life of the machine.

The machine may be the most accurate in the world, but if the operators all try to keep away from it because it is awkward to use, the purchasing agent will likely try some other make next time. If it is a great producer, but the tools cannot be depended on to follow their appointed paths and the work coming from it is irregular and does not come within the gage limits, there is no use pretending that the machine is high grade. Every point about the use of the machine must make it the fittest possible for the work it is to do, or it cannot be called high grade.

Followed to the logical conclusion there can be very few high-grade machines under our present system of manufacture. Our machines are designed for a little higher than average conditions. A lathe, built for general use, may have a very poor lead screw and not one customer in a thousand will ever know it. For the benefit of this one customer, most lathe manufacturers try to get pretty good lead screws, and the other nine hundred ninety-nine customers who do not need this refinement, pay extra on that account.

A machine heavy enough to be rigid under certain exacting conditions will be so hard to handle that the design cannot be adapted to the general market. All our machine design is a compromise, and a compromise is never perfect. Even in a machine designed especially for a given job it is necessary to compromise between accuracy, weight, cost and interchangeability, to say nothing of many other things of lesser importance. So possibly we may all be obliged to fall back upon the generally accepted notion that a machine, to be considered high grade, must measure up to the standard set by a successful manufacturer of machines of the same general character.

Shall We Lead Or Follow?

THE United States and England are the two greatest manufacturing and exporting nations today. They both use the English or inch system of measurement.

The World Trade "Club" has for its object the discarding of our present system of measurement and *forcing* us to use the metric system. The metric system was legalized by Congress over fifty years ago. If it were better suited for use in the metal-working industries, it would have been adopted by them years ago—but it isn't.

The changing of our system of measurement would cause endless confusion—**and those who started the World Trade "Club" know it, *but some of their deluded followers do not.***

The World Trade Club was first started under very suspicious circumstances—in fact, one of the first letters received from it practically needed translation, and we called attention to this in an editorial at the time. The German flavor was unmistakable. Now this same "Club" in its literature holds up to the American people the fact that "Germany adopted the Metric System in 1871." ***More German Kultur!***

We will say right here—No one could fight more effectively for the kaiser than to force through a compulsory metric law now. *If such a law is passed we will have lost the war.*

The confusion and expense such a law would cause is clearly shown in the letters that follow—letters from men of standing, and known throughout the manufacturing world—men who are not afraid to come out in the open and ***sign*** their letters!

We wish to call especial attention to the letter from Pratt & Whitney, one of the firms that the World Trade Club claims is in favor of the metric system.

We wish also to call the attention of all to the fact that this "Club" is widely advertising the U. S. American National Manufacturers' Association as in favor of metrics. This is an utterly unknown "organization" and the name has apparently been chosen with the deliberate intent to confuse the reader into thinking it is the National Association of Manufacturers—an organization which has been in existence nearly twenty-five years, and which is opposed to the metric system and has in its ranks some of the best known manufacturers in the world.

The whole output of literature from this so-called club is a cleverly worded lot of misrepresentation. The ***few*** reliable men who have been drawn into backing it are either not manufacturers in any sense of the word or are deluded by the plausible-sounding propaganda.

It is ridiculous for any man to say, as this "Club" claims, that the World War would have been shortened a single day if all the allies had been standardized on metric measurements. The measuring system used has nothing whatever to do with standardization of parts or interchangeability.

Does anyone think for a second that if our 0.30-caliber cartridges had been measured in metrics they would have fitted a British rifle chambered for a 0.303-caliber cartridge? Both France and Germany used metric shell sizes, but would a French 75-mm. shell fit a German 77-mm. gun or vice versa? Even had these shell both been of the same diameter, there is no assurance that they would be of the same taper, length, weight or design of head. Unless they were, they could not be used in the same gun, whether made to inch or to metric measurements.

Isn't it significant that this "Club" should have its headquarters in San Francisco, Calif., and that the Chamber of Commerce of the State of Washington should back the campaign?

The plain answer is that these are non-manufacturing states and easy to persuade, for they have less at stake than the Middle or Eastern States.

Are we, as Americans or as British, going to let people who know absolutely nothing of machine building or real manufacturing problems force us to adopt a system that doesn't fit? The measuring system we now have is all right—to change it will utterly disrupt our machinery makers and upset every industry dependent on them—even the mining industry, lumber industry, and all others of the West that use machinery of any kind.

Are we going to stand for the compulsory metric system and all the chaos it means? Let us all stand up on our hind legs like real he men and say No! It is up to you, gentlemen, to enlighten your representatives in Congress and your Chambers of Commerce as to what is impending.

Are we to follow Germany or lead the World?

Ethan Viall

Editor

What Real He Men Think *of the* Compulsory Metric System

Milwaukee, Wis., January 22, 1920

MR. ETHAN VIALL, EDITOR,
American Machinist,
Tenth Avenue and Thirty-sixth Street,
New York.

My dear Mr. Viall:

I understand that there is a revival of the movement to make the use of the metric system compulsory in the United States.

Please suggest to our lawmakers that they send a commission to visit the machine shops of France, where the metric system was first introduced before France became an industrial country. If this commission will make the investigation, they will find the English system of measurements very largely used.

I recently visited a number of plants in the vicinity of Paris and found that many of the screw threads used in those plants were expressed in the number of threads per inch, just the same as in the United States. I fear that the people who are advocating the compulsory metric system do not realize that the United States has become a great industrial country, standardized on the English system of measurements, and that the change to the metric system would involve enormous loss in invested capital; also great loss in production for many years to come, owing to the necessity of educating workmen in a new measurement language.

It is difficult to see why our Government should insist on our using a system which is by no means uniform in the country of origin.

You may rest assured that if France had become an industrial nation, standardized on English measurements, they would not at this day be advocating a change.

You should use your best endeavors to spread information to those who speak from a theoretical, rather than from a practical standpoint, to the end that this unwise agitation may be abated.

With kind regards,

Very truly yours,
KEARNEY & TRECKER CO.
E. J. KEARNEY.

Philadelphia, Pa., January 22, 1920.

MR. ETHAN VIALL, EDITOR,
American Machinist,
10th Avenue and 36th Street,
New York, N. Y.

Dear Sir:

We are in receipt of your favor of January 16th, asking our views as to the proposed law for the compulsory introduction of the metric system.

We are absolutely opposed to any attempt to force the use of this system upon the people of this country.

The French units have been legalized by our Government and accurate standards have been prepared for distribution. This, we think, is as far as the Government should go. **If the metric system is much better than our system of weights and measures, as its proponents claim it to be, it will gradually supersede our system without the violent disturbances which would result from an attempt to force the change.**

We have no objection whatever to the use of the metric system by any one who desires it. We, ourselves, found it advantageous when we began the manufacture of the Gifford Injector in 1860, to work to the French drawings and measurements; and we made all of our gages and tools accordingly. We have continued this use in the Injector Department; but have found no such marked advantage that would encourage us to extend the use of the French units into any other branch of our business, as all are equipped with gages and tools based on the inch.

Much stress is laid on the advantages that the adoption of metric measurements would have in extending our foreign trade. This point, in our judgment, has been greatly overstated. In our own business, we are satisfied that not a single sale has been influenced by the fact that our machines are built on the inch basis. It frequently happens that the foreign buyer expresses the desired capacity of the machine in metric dimensions. If so, we quote on our nearest size, expressing the figures in the equivalent French units. It makes absolutely no difference to the buyer what system was used in the construction of the machine; but he occasionally asks that the feed screws should have metric threads or that the machine should be arranged to cut such threads. As a case in point, we recently furnished a number of large boring and turning mills to the French Government for general use, where the question of metric dimensions was not even mentioned.

Manufacturers of this country have been struggling for years toward standardization and much has been accomplished. Large amounts have been expended for tools, gages and other special equipment, which would be rendered useless if our standards were changed; but even if we were willing to incur the considerable expense of new equipment, we could not abandon the old, for we must always be prepared to make replacements. This would involve two kinds of stock and constant confusion. We all know how hard it is to change usage, as is well illustrated in our screw threads; for the old sharp "V" has not yet entirely disappeared, although the U. S. system was recommended in 1864 and adopted by the Navy Department in 1868; nor has entire agreement been reached as to the number of threads per inch for any given diameter.

As a matter of fact, the French themselves have not attained complete uniformity in regard to screw threads, although a standard was formally adopted by an International Congress many years ago.

Any attempt to force the metric system on the country by legislative enactment would have a deplorable immediate effect, without any compensating ultimate advantage.

Yours truly,

WM. SELLERS & CO., Incorporated,
Coleman Sellers, Jr.,
President.

What Real He Men Think of the Compulsory Metric System

January 26, 1920.

Mr. Ethan Viall, Editor,
American Machinist.

Dear Mr. Viall:

The passage of a compulsory metric measurement law by Congress can have but one result, viz:

The Complete Paralysis of Mechanical Industry in America.

The monetary loss connected with the discard of equipment now in use, comprising jigs, fixtures and measuring instruments, mounts into millions. Its total is incalculable. The time loss, both in production and to the millions of men engaged therein, with resultant loss of wages, cannot be figured, as it is no simple matter to change all drawings, replace all discarded equipment and accustom hundreds of thousands of men to a new system of measurement.

America, pre-eminently the leader in mechanical ingenuity and productive capacity, would be set back as if by the devastation of war, and the world, which now depends upon this nation for the equipment required for reconstruction purposes, would be at a standstill.

Any change from present standards would so retard American production of mechanical necessities that the loss to the world would be insufferable.

THE BULLARD MCH. TOOL CO.
Bridgeport, Connecticut.

New York, January 29, 1920.

American Machinist,
Mr. Ethan Viall, Editor.

Dear Sir:

I send you the following in response to the request in your letter of 26th instant.

Since 1866 the use of the metric system in this country has been legal and permissible to all who care to avail of it. Not content with this freedom, the few who use the metric system, and who prefer it to our established system of weights and measures, are seeking legislation whereby all the rest of us, who differ with them on this subject, shall be deprived of our liberty, and compelled to abandon the use of our old standards. The chief argument in favor of this most undemocratic project is that it will bring about *uniformity* of practice with all the so-called "pro-metric" countries, and thereby greatly promote the development of our export trade. "But," said John Quincy Adams in his masterly report of 1828 on this subject, "is your object *uniformity*? Then, before you change any part of your system, such as it is, compare the uniformity that you must lose, with the uniformity that you may gain, by the alteration." We now have uniformity throughout this country, and practically with Great Britain and her Colonies, and this uniformity would be lost under the proposed change, because we should then for a century at least, have both systems in use. To this day France has not yet succeeded in displacing entirely from use her ancient measures of length and volume, while in most of the other so-called "pro-metric" countries the old units persist, and in many cases predominate. Our imports from "pro-metric" countries are not decreased by their use of the metric system, nor would our exports to them be materially affected by our adoption of that system.

Another argument is based on the advantages of the decimal system of notation, but this is not peculiar to the metric system. In surveyors' work, our foot has been decimalized about a hundred years, and in all fine machine work the decimalized inch is in almost universal use. For the every-day transactions of life, vulgar fractions are better than decimal and are universally used, even in "pro-metric" countries. Binary division is natural and simple; decimal division is not, except for calculating and accounting. A child naturally divides an apple into halves and quarters; never into tenths.

Before the people of this country are asked to sanction the proposed change of standards, they should have a clear understanding of all that it would involve. When they have such understanding I predict that they will overwhelmingly refuse to sanction the change. Any attempt to "put over" the change in advance of such understanding should be opposed by all as unfair, unreasonable, and undemocratic.

Yours very truly,
YALE & TOWNE MFG. CO.
Henry R. Towne.

January 29, 1920

American Machinist
Mr. Ethan Viall, Editor,

Dear Sir:

Supplementing our letter of January 19th, we are just advised by Mr. Burlingame that our name has been used by the "World Trade Club," as urging metric standardization.

Such use is entirely without our knowledge or authority and you are at liberty to make the most of the fact that such unauthorized use is being made.

We are writing to the "World Trade Club" in protest, but this protest will, of course, not reach the public who are interested.

Yours very truly,
PRATT & WHITNEY CO.,
B. H. BLOOD,
General Manager.

Hartford, Conn., January 20, 1920.

Mr. Ethan Viall, Editor,
American Machinist.

Dear Mr. Viall:

Replying to your letter of Jan. 16th it would seem as though there was no doubt in the mind of any thinking man, acquainted with the mechanical industry in any of its branches, that the compulsory adoption of the metric system would mean a tremendous loss for a great number of years to every individual member connected with the mechanical industry on account of the fact that every one of their parts and tools and machines are made on the English system; and there would have to be a complete redesigning of all the different articles that enter into mechanical works and a complete re-education of all the men employed in the industry in order to make them familiar enough with the metric system to do the work with the same degree of efficiency as they are now working under the present system.

It seems to me, however, regardless of many opinions to the contrary, that it will be absolutely impossible for our Government to make the metric system compulsory in the true sense of the word; and, regardless of the large amount of money that is being spent by the promoters of the metric system that, when the large amount of evidence is acquired showing the tremendous expense and annoyance and trouble that it will cause, it will not be so easy to adopt as what it might seem at this time.

Yours very truly,
THE HENRY AND WRIGHT MANUFACTURING CO.
R. M. Wright
General Manager.

Cleveland, Ohio, January 22, 1920.

American Machinist.
Attention of Mr. Ethan Viall, Editor.

Gentlemen:

It seems to us that to make the metric system compulsory would be an inconceivable calamity to the machine-tool industry. **The war proved, as it had never been proved before,** how important this industry is to the welfare of the country. Not only would the change be exceedingly expensive, but it would be crippling to many, to say nothing of the upsetting of the industry in general and at a time when it seems to us that it should be maintained at its highest efficiency, on account of the unsettled world conditions, so that it is not at all certain when the full strength of these resources may be required again, **possibly in the not distant future.**

We consider it exceedingly unpatriotic to foist this system on the country, particularly at this time.

Yours very truly,
LUCAS MACHINE TOOL CO.,
J. A. Yost.

Boston, Mass., January 20, 1920.
Ethan Viall, *Editor*,
American Machinist.

Dear Mr. Viall:

In reference to the movement now under way to pass a law through Congress, making the use of the metric system compulsory, we feel that this would work a severe hardship to us and prove a very costly experiment to the machine shops of this country.

We can realize the difficulties in explaining the reasons to the average Congressman or in fact, any man whose training has not embraced actual machine-shop experience.

It would be impossible to calculate with any degree of accuracy the cost to us and to other manufacturers of this change, and, furthermore, we have failed to perceive any appreciable public demand for such compulsory legislation, requiring this change in our standards of measurement.

We have always made large shipments to Europe of our product and only in rare cases have metric measurements been specified.

We sincerely trust this legislation will not be passed.

Very truly yours,
BECKER MILLING MACHINE CO.,
J. P. Lesley,
General Manager.

P.S.—I believe such a law would be unconstitutional.

Worcester, Mass., January 19, 1920.
American Machinist.
Refer to Ethan Viall, Editor

Gentlemen:

In reference to making the metric system compulsory, we are emphatically against such action.

Respectfully yours,
WOODWARD & POWELL PLANER CO.,
E. M. Woodward,
President and Treasurer.

Madison, Wis., January 21, 1920.
Mr. Ethan Viall,
American Machinist.

Dear Sir:

In reply to yours of the 16th would say that we are most decidedly opposed to making the use of the metric system compulsory.

Yours very truly,
GISHOLT MACHINE COMPANY,
C. A. Johnson.

Springfield, Vt., January 20, 1920.
American Machinist.
Attention Mr. Ethan Viall, Editor

Gentlemen:

We are very much against the idea of making the metric system compulsory.

There are so many complications attending this change, in connection with machine-tool manufacturing, that we fail to see enough advantage to offset the difficulties.

The change would surely bring about a serious upset in production, with a tremendous loss both to the manufacturer and to the shop laborers. A large percentage of labor at the present day throughout the country is subject to piece-work basis of some character, and the re-education of the shop men, necessary to read drawings, would surely cause a serious loss to them in their wages. At the present time we surely have labor troubles enough, without adding any new factor of discontent.

Very truly yours,
BRYANT CHUCKING GRINDER CO.,
W. L. Bryant,
President.

New Bedford, Mass., Jan. 26, 1920.
Ethan Viall, Editor,
American Machinist.

Dear Sir:

We think that one of the most serious mistakes that could be made would be to have the next Congress place thereon a law making the use of the metric system compulsory. The investment that would be necessary to make this change is something appalling. Beside that, the inconvenience to the manufacturer of the product in this country and throughout the world would be unmeasurable.

We should deem it a very unwise course to pursue, and unfair to the general manufacturing interests of the country.

Yours truly,
MORSE TWIST DRILL AND MACHINE CO.

World Recognized Associations That Are Against The Metric System

National Machine Tool Builders' Association

National Metal Trades Association

National Founders' Association

National Association of Manufacturers

Cleveland, Ohio, January 20, 1920.
Mr. Ethan Viall, Editor,
American Machinist.

Dear Sir:

Without going into the detail of the contemplated change to the metric system would say that this change would be a great mistake and extremely detrimental to all industries. The expense in new equipment and changing of old, coupled with the loss of efficiency during the long period which would be required to educate workmen and designers in the use of a new system, would be a blow to industry from which they could not possibly recover for a long time.

Yours very truly,
THE FOOTE-BURT COMPANY,
G. E. Randles,
President.

Springfield, Ohio, Jan. 28, 1920.
The American Machinist
Attention Ethan Viall, Editor

Gentlemen:

Answering yours of the 26th, in reference to Congress making the use of the metric system compulsory, would say we are against the adoption of the metric system in any form and have repeatedly written our Congressman, Hon. S. D. Fess, protesting against any such law.

Yours truly,
THE SAFETY EMERY WHEEL CO.
A. G. Spencer,
Vice President & General Manager.

Indianapolis, Ind., Jan. 20, 1920.
American Machinist,
Attention Mr. E. Viall, Editor

Gentlemen:

Replying to your letter of Jan. 16th, we are decidedly against the use of the metric system, as it would not only *create industrial confusion for a long period of time but would cost thousands of dollars* for our company alone to change over, and there would be no advantage in it.

We are very decidedly against the adoption of the metric system.

Yours very truly,
MILLHOLLAND MACHINE CO.
W. K. Millholland,
President.

Grand Rapids, Mich., January 22, 1920.
Mr. Ethan Viall, *Editor*,
American Machinist.

Dear Sir:

I believe that the movement to force compulsory use of the metric system in this country is little short of a crime and the height of economic folly. The fallacy has been well exposed by one of your former editors and we would endorse what he has said in its entirety.

The use of the metric system is now optional and if it were advantageous, the American and British manufacturers and merchants, who are leaders in world trade, would have adopted it. It has been adopted in some lines where the advantage was sufficient and the cost not too excessive but to endeavor to force it upon industries where the cost is excessive and the advantages negligible, is a crime. When we need economy in manufacture and quantity production of goods as we never needed it before in the history of the world, when hours of labor are being shortened and the wages per hour increased, it behooves us to do everything possible to conserve every moment of time. The millions of dollars that would be wasted in trying to change from present standards to metric can only be well understood by those who are in such a basic industry as machine-tool manufacturing.

Machine-tool manufacturers export a considerable percentage of their total manufacture to the markets of the world, to metric and non-metric countries alike. American machine tools made under our present standards stand the highest in the estimation of users in metric as well as non-metric countries, bringing premium prices of 100 per cent. and more in metric

countries over other machines of similar capacity made exclusively under the metric system. Why then should we change?

Much of the propaganda in favor of metric system seems to me to be pro-German in its basic idea and to partake of the same nature as the proverbial fox, who, having lost his tail, tried to get all the other foxes to cut their tails off too.

If manufacturing under a metric system could be handled so economically, why was not Germany with her lower wages, longer hours and admittedly, in many cases, better trained and educated workmen, able to compete with American manufacturers in a more economical way than she did? The two greatest commercial and manufacturing nations in the world, the United States and Great Britain and the latter with all her colonies, including Canada, Australia, India, South Africa, etc., have no difficulty in doing business with our established system of weights and measures. Why should we join the defeated Central powers and the Bolsheviki of Russia and the, practically speaking, negligible factors in the world's commerce, as represented by the other metric countries, in the effort to force the compulsory use of the metric system.

If, for the sake of argument we admit that the "angel" in San Francisco, who is financially back of a lot of this propaganda in favor of the metric system, is actuated by good intentions, it is only necessary to point out the truth of the old adage that those same good intentions are used as the pavement on the road to the place of future abode that we all hope to escape.

Yours truly,
GRAND RAPIDS GRINDING MACHINE CO.,
S. Owen Livingston,
President.

Worcester, Mass., Jan. 30, 1920.

Mr. Ethan Viall,
Editor American Machinist,
New York, N. Y.

Dear Sir:

In reply to your letter of January 16th with reference to compulsory use of the metric system would say that as I understand it, this system covers weights and measures only, while users of this system still have to use 360 deg. to the circle, 60 min. to the degree, and 60 sec. to the minute. I understand also that they are content to use clocks with the face divided into 12 hours, and with the hour made up of 60 min. to the hour, and 60 sec. to the minute.

> Now, WHY under the sun don't the advocates of the metric system make a complete and consistent job of the whole matter and change over the circular measurements to give 100 deg. to the circle, 100 min. to the degree and 100 sec. to the minute?
>
> And, WHY don't they change over their clocks to 100 hr. to the day, 100 min. to the hour, and 100 sec. to the minute?

When they will agree to do that, they can properly ask the rest of us to change over from what we are now doing and have the complete system become universal.

To be consistent, they should not object to having to throw away all their fine watches and clocks and all their handbooks, reference books and data sheets on engineering problems in which time is an element, and they should not object to throwing away all books on engineering problems and give up all reference books and data sheets contained in the records of countless problems worked out in geometry, trigonometry or astronomy, because they are asking us to make just as much of a change in changing the weights and measures as for us to ask them to change records regarding time and areas.

In fact they ought to go one step further and make compulsory the use of the French language so that our commercial and social work shall be as universal as the matter of measurements. In fact, it is a question whether it is not of more importance to be able to sell our neighbor and our foreign friend a typewriter, a meat chopper, or a sewing machine, and arrange the commercial details satisfactorily, than it is to be able to call a bar of iron one meter long as compared with calling it 39 in. long.

Therefore, the writer believes that the idea is fine, only it doesn't go far enough. Not only should the metric system of weights and measures be made compulsory, but also a new system with regard to time, with regard to circular measurements, and with regard to the language we use in dealing with our customers.

Until these theorists with no financial interests at stake are ready to go the whole figure and have a consistent system, they cannot reasonably take exception to other people hesitating to change over and adopt but a part of it when even that involves tremendous expense.

Yours very truly,
JAS. N. HEALD.

Rockford, Ill., January 20, 1920.

American Machinist.

Attention Ethan Viall, Editor.

Gentlemen:

Yours of the 16th received regarding the matter of forcing through a law in the next session of Congress for making use of the metric system compulsory. We are not in favor of the metric system, and only hope that the change will never be made. *We certainly believe that it would be the greatest injustice that was ever put over on not only the users but manufacturers of machinery.*

In the meantime, we remain,

Yours truly,
W. F. & JOHN BARNES CO.

Cincinnati, O., January 19, 1920.

American Machinist,
New York City.

Gentlemen:

Mr. Viall's favor of the 16th, in regard to the metric system, received.

We have threshed this matter out on several occasions, and as far as the R. K. LeBlond Machine Tool Company is concerned, it is absolutely opposed to a change of this kind. While the metric system looks very good from a theoretical standpoint, it does not work out in practice as well as our present system. **The metric thread system is not as good as the United States Standard. Not only this, the nations using the metric system are also using halves and quarters of the decimals of the meter.**

Yours respectfully,
THE R. K. LeBLOND MCH. TOOL CO.

Cincinnati, January 19, 1920.

Mr. Ethan Viall, Editor,
American Machinist.

Dear Sir:

Replying to your favor of the 16th re. a plan to force through Congress a bill making the use of the metric system compulsory, would state that it is about time for manufacturers to "go to the mat" with those who are forcing such a condition. It is a mighty easy thing to talk about the beauties of the metric system, but if the manufacturers are ever forced to use it, I think that such a protest will be made as Congress has never before heard.

I have heard various people discuss it and say how much more simple it would be than our present type of measurement, and perhaps it would be more simple; but so many hundreds of millions of dollars have been spent in this country by manufacturers for measuring instruments, and for jigs, fixtures, tools, etc., made from those instruments, that it seems that those advocating the metric system have no idea whatsoever of this condition and how much it would cost the manufacturers of this country to change from one system to another.

I would suggest that an investigation be made to learn about the people who are back of this movement, and when they are found, that an explanation be demanded in a manner they cannot fail to understand.

May I suggest such a course!

Yours very truly,
THE AMERICAN TOOL WORKS CO.
J. B. Doan,
President and General Manager.

Nashua, N. H., January 27, 1920.

Attention: Mr. Ethan Viall

American Machinist

Gentlemen:

In regard to the compulsory use of the metric system, I can only compare such a course by Congress to a man who voluntarily contracts a malady believing it will make him immune from the disease. It would be a very serious illness to the machine-tool and other machinery industries in this country, and the advantages would be comparatively small. We hope no such measure will pass Congress.

Yours very truly,
THE FLATHER MFG. COMPANY
H. E. Flather,
President.

Dubuque, Ia., January 24, 1920.

American Machinist.
Mr. Ethan Viall:

In reply to your letter to Mr. Eugene Adams, president of the Adams Company, relative to a change to the metric system, would state that all the mechanical men in this company are bitterly opposed to a change from our present linear measure of foot, inch and thousandth thereof.

We believe a compulsory change to the metric system would cause incalculable damage to the machine builders in this country.

THE ADAMS COMPANY,
F. O. Farwell,
Gen'l Supt.

A German's View of the Industrial Situation in Germany

REPORTS from all parts of the metal industry agree in stating that during the past few months there evidently has been a turn for the better. The lowest point of economical decline in Germany has been passed, and one can clearly sense the signs of a powerful rising movement. The output of industrial establishments is increasing; the desire to work harder and better seems to have entered into the minds of the workers—due to the realization that the true value of wages paid lies in the value of work obtained therefor, and that the healthiest and best road to a betterment of wage and working conditions lies in the raising of the buying value of the monetary unit, and this can only be obtained through a concentrated effort on the part of all workers to increase their production.

When we speak of a "desire to work harder and better," we do not mean solely the efforts of the workers. We mean also the desire to work on the part of the employers. This has been at a low ebb during the past few years. The initiative, so long lacking, has returned in a manner which is decidedly gratifying to industry.

Everywhere we find indications of a tremendous increase in work and new enterprises. The difficulties which have to be overcome, are still very great, for the importation of essential raw materials and fuel is still halting and unsatisfactory, and this makes quantity production almost unattainable. But the people have begun to take courage, and have a greater confidence in a brighter future, which helps them overcome the difficulties mentioned. In fact, an incredible and marvelous amount of work has been accomplished in the face of difficulties that have been without parallel, and when the history of German industrial operations shall hereafter be written, the fight during the year 1919, against the heaviest odds, will undoubtedly be notable.

Among industrial branches which have progressed furthest during the past few months the first place belongs without a doubt to iron and steel. One of the surest signs of re-awakened interest in all phases of the steel industry is the condition of the machine-tool industry, and the increase or decrease in the consumption of machine tools has always been considered a sort of barometer for the allied industries. If the demand for machine tools shows a steady increase over a period of months, one may judge with perfect safety that a strong upward movement has started throughout the nation's industries.

One of the most peculiar things to be noted at this time is the complete absence of second-hand machine tools—such as have been thrown on the market in other industrial countries, even in the United States of America, in large quantities. We had been warned, and seemingly rightly, that with the cessation of the manufacture of war materials there would be a large number of used machine tools of all types on the market. Only a very small portion of this dreaded warning has been fulfilled. Each edition of a prominent American trade journal contains about 30 pages of such offerings, and in one particular issue there were counted more than 10,000 such machines. Compared with such quantities, the amount of used machinery and machine tools offered in Germany is infinitesimal. This certainly proves that the factories which have been making munitions and war materials have no intention of going out of business, but have immediately taken up machine-tool and other kinds of industrial work. Everywhere we find new types, new inventions and new apparatus, and the feverish desire to improve on the existing equipment, held in leash so long by war-imposed restraint, shows plainly in all parts of the country.

At the same time it is worthy of note that most of the large factories have gone over their production programs with extreme care, and have eliminated the former policy of scattering efforts. Instead, each firm has laid down a program of concentration and specialization, and it must be admitted that the bitter experiences of the war had their effect in clearing away the cobwebs of ultra-conservatism in production methods. Specialization and multiple production are now considered as the goal to be striven for in all factories, and the indications in all plants of the country are that this policy of multiple production will hereafter be carried out everywhere.

Below is given a review of present activities in a large number of German factories, which make a specialty of machines and machine tools, hand tools and equipment for other factories:

Aerzener Maschinenfabrik G.m.b.H., Aerzen.—Pneumatic hammers.

Ako Werkzeugmaschinen, Dresden, formerly Auerbach & Co.—Lathes, grinding machines.

Armatur und Pumpenfabrik Keller & Co., Chemnitz.—Condensers, steam traps, geared pumps, air pumps, air compressors and wet air pumps. Among its most important products are steam-pressure reducing valves.

E. O. Bartz & Bolle, Berlin S. 42.—This firm is representative for the Palli hardening process in Germany.

Bausch & Sohn, Köln-Bayenthal.—Belting.

A. Bay, Stuttgart.—Metal saw frames.

F. W. Beckmann, G.m.b.H., Solingen.—Universal tool grinding machines, disk grinding machines.

Beling & Lübke, Berlin SW.—Vertical and horizontal milling machines, lathes, grinding machines.

Wilhelm Th. Benning, Düsseldorf.—Machinery and tools for the production of locomotives, cars, switches for railroads, and automobiles.

Paul Blell, Werkzeugmaschinenfabrik, Zeulenroda (Thür.—Lathes, radial drilling and planing machines, in small and medium sizes.

Gebr. Böhringer, Werkzeugmaschinenfabrik, Göppingen, Württemberg.—Lathes, planing machines and automatic machines. This firm has been expanded considerably during the past few years. It now employs 1400 men and makes a specialty of the following types of machinery: Turning lathes; turret lathes of various sizes, capable of handling pieces up to 1050 mm. diameter; planing machines of 600 to 2500 mm., planing surface; automatic machines, system Gridley, of 57, 82 and 108 mm.

G. Boley, Werkzeug & Maschinenfabrik, Esslingen a.N.—This firm manufactures milling machines, precision lathes, turret lathes, hand milling machines for precision work and optical work, lathes and tools for jewelers and watchmakers, and small vises. Delivery of these products can usually be accomplished within two to four months.

Boley & Leinen, G.m.b.H., Esslingen.—Turret lathes.

Brüder Boye, Berlin.—Smelting and hardening furnaces.

Franz Braun A.-Ges., Zerbst-Anhalt.—Lathes in many sizes and types; high-speed lathes in eight different models; high-speed lathes with constant-speed drive in eight models; heavy ordinary and automatic turret lathes; vertical and radial drilling machines; punching, shaping, and axle-boring machines.

Burkhardt & Weber, Reutlingen-W.—Cold sawing machines for cold steel; saw grinding machines; circular saws, trademark "Perfekt"; boring machines.

Th. Calow & Co., Maschinenfabrik und Eisengiesserei, Bielefeld.—This firm manufactures chiefly presses, milling, pointing and thread cutting machines for the manufacture of screws and bolts; stamping machines for the manufacture of steel balls from cold-drawn steel rods. It agrees to demonstrate to prospective customers any of its products under actual working conditions.

Victor Curstädt Maschinen und Werkzeugmaschinenfabrik, Berlin-Charlottenburg.—This firm makes a specialty of precision grinding machines for high-grade work, according to the Norton system. These machines are especially adapted to the manufacture of small tools and small parts of other machines and range in size up to 90 x 250 mm.

Delfosse, Motorenfabrik G.m.b.H., Cöln-Riehl.—Motors, precision lathes. It can promise delivery immediately or on very short notice.

Wilhelm Dempewolf, Cöln-Ehrenfeld.—Gears.

Deutsche Gussstahlkugel- und Maschinenfabrik A.-G., Schweinfurt.—Ball bearings.

Deutsche Hebezengfabrik, Wilh. Pützer, Düsseldorf.—Chain hoists.

Deutsche Kugellagerfabrik, G.m.b.H. Leipzig-Plagwitz.—Ball bearings.

Deutsche Spiralbohrer- und Werkzeugfabriken, G.m.b.H., Remscheid-Vieringhausen.—This firm has enlarged its capacities considerably during the past years, and is now one of the most important makers of twist-drills in the country. Delivery usually from stock or on short notice.

Deutsch-Luxemburgische Bergwerks und Hütten Aktien-Gesellschaft, Dortmund.—High-price alloy steels, tool steels and construction steels.

Carl Dietlein Maschinenfabrik- und Apparate Bauanstalt, Magdeburg-Neustadt.—Its specialty is the construction of equipment for autogenous welding. Its apparatus is designed and constructed so as to give a maximum of safety in operation. Fifteen different types are produced varying from a carbide capacity of 2 kg. to 100 kg. All the smaller apparatus, up to 10 kg. capacity for a single charge, can be supplied at short notice.

Diskus Werke, Frankfurt a/M. — Surface grinding machines.

Donan-Werk Ernst Krause, Wien.—This well-known wholesale house for machine tools operates its own factory in Wien, and has recently extended its activities into Germany. A branch is maintained in Berlin. The firm recently acquired control of the Werkzeugmaschinenfabrik Brune, Cöln-Ehrenfeld, maker of planing machines.

Oscar Ehrlich, Drehbankfabrik, Chemnitz.—All types of medium and small size lathes, precision lathes, automatic gear cutting machines, and centering machines.

Eikar G.m.b.H. Maschinen und Werkzeugfabrik, Cöln-Braunsfeld.—Large and small vises, of metal and wood. The former can be supplied in one to two months' time; the latter are sold out for the next 18 months

Elektrische Schweissmaschinen, G.m.b.H., Charlottenburg.—Electric welding machines of all types and sizes, ordinary type and automatic, for tin cans, large tins and cans, for small openings and whole seams.

Fichtel & Sachs, Schweinfurt a/M.—Ball bearings.

Max Fischer, Holzwarenfabrik, Marienberg, i/S.—The specialty of this firm is handles and grips for tools, provided with patented metal gripping device, which prevents splitting of handle.

Gama, Otto Eckelt, Berlin N 39.—Gas furnaces for all purposes.

J. Gast, Komm.-Ges. Berlin-Lichtenberg.—Turret lathes.

Richard Grassmann, Chemnitz-Altendorf.—Steel bolts and nuts.

Hahn & Kolb, Werkzeugmaschinenfabrik Index, Obereslingen a/N.—Machines for straightening crankshafts, smelting and hardening furnaces, grinding machines for all types of tools, automatic screw machines.

Händel & Reibisch, Dresden-A.—High-efficiency saws.

Carl Hasse & Wrede, Berlin N 20.—Turret lathes, automatic machines.

P. W. Hassel & Co., Maschinenfabrik & Eisengiesserei, Hagen i.Westph.—This firm supplies the complete equipment for manufacture of iron and steel products. Its service is in two parts: the laying out and equipping of complete shops of even the largest size, comprising mostly machines made by the same firm, and the equipping of existing shops with single pieces of special machinery for certain purposes. The machines turned out by this firm include complete rolling mills for medium and heavy steel work; cold steel rolling mills; eccentric and friction presses; belt-driven drop hammers and other heavy hammer equipment; wire-drawing machines; special machines for quantity production of car springs, both leaf and spiral, for locomotives, railroad and trolley cars; large and medium screws and bolts for railroad shop work. All this material is kept in stock and shipments can be made on the shortest notice.

Gebrüder Hau, Maschinenfabrik, Offenbach-Bürgel.—Oil centrifugals, screw cutting machines, horizontal boring machines, tool grinding machines.

Heidenreich & Harbeck, Hamburg.—High-speed lathes.

Friedrich Hollmann, Präcisions-Kugellagerfabrik, Wetzlar.—Precision ball bearings and balls for all types of machinery. Able to make delivery of normal sizes in short time.

Huth'sche Eisen & Stahlwerke, Gevelsberg.—Castings of grey iron and steel.

Jaegerstahl G.m.b.H., Mannheim-Waldhof.—Tool steel.

Fr. Aug. Jahn, Gera.—Universal tool grinding machines, boring and milling machines of various types.

Kalthof & Meyer, Milspe i.W.—Screws, bolts, nuts and bed plates for dies.

Fr. Keilpart & Co., Messwerkzeugfabrik, Suhl.—For 40 years specialist in precision measuring instruments, micrometers for inside and outside diameters; depth measuring instruments with dials showing the measurements accurately to 1/100 mm.; compasses, metal triangles and hardened flexible measuring rules. Delivery in two to four months.

Keller & Knappich G.m.b.H., Augsburg.—Autogenous welding and cutting installations, from the smallest to the largest sizes. Acetylene generators built on the principle "carbide into water" and huge underground installations for technical purposes, up to an hourly production of 36 000 liters; all parts of such apparatus, including burners with exchangeable tips; cutting burners for cutting materials up to 800 mm. thickness; carbide testing apparatus; acetylene searchlights. During the war this firm made a specialty of a new type of chain hoist, built on the system "Kuka," with and without automatic brakes. The same firm has announced for the present year an entirely new kind of safety hoist, which lowers the load automatically at a certain pre-arranged speed, without turning the handle, while a single short pull on the chain stops the downward travel of the load at any moment desired. The firm is able to deliver small hoists direct from stock; larger installations in two weeks to two months.

Paul Kellner Maschinenfabrik, Gössnitz (S-A).—Lathes with ball bearings and fitted with a new type of chuck for gripping the material to be worked. These machines are being turned out in mass production, in sizes varying from 1600 to 2000 mm. length, and 225 to 400 mm. swing. They can be ordered from stock for immediate delivery. Another product of this firm is a "parallel vise" capable of taking pieces up to 120 mm., between its jaws.

Karl Krappe, Dresden. Emery wheels.

C. Oswald Liebscher, Dresden-A.—Gear cutting machines, lathes, milling machines.

Walter Loebel, Maschinenfabrik, Leipzig.—Specialties of this firm are high-speed lathes, built in series in several sizes and types. Delivery of small lathes, four weeks; toolroom lathes, four months; and high-speed lathes, seven months.

Ludwig Loewe & Co., Aktien-Gesellschaft, Berlin N.W. 87.—This company has many distinctive branches in its huge establishment. In the division for machine tools it produces nearly every type of lathe, milling and boring machine in existence. In the division for special machine construction the chief product consists of machines for the manufacture of rifles, pistols and ammunition. In the division for tools, the company produces an immense variety of tools, from the simplest merchanic's equipment to the most delicate measuring instruments, and precision tools of the highest type. In still another division it constructs the entire equipment for a modern machine shop. Other divisions make castings of iron, steel, brass and other nonferrous metals, and special alloys. One of its important parts is the famous commercial laboratory for the iron and steel industry maintained by it.

Ernst Löwen, Gesenkschmiederei- und Fabrik für Eisenbahnoedarf, Milspe i/Westf.—This firm makes forgings up to 40 kg. Its specialty is forgings for railroad cars, bumpers, couplings and turnbuckles. The firm is one of the oldest and most capable in its field.

Magdeburger Werkzeugmaschinenfabrik A-G, Magdeburg has become one of the largest manufacturers of turning lathes and turret lathes in Germany. Its products are made in series, by multiple production methods.

Magnetwerke G.m.b.H., Eisenach.—Electromagnets for

ifting and coupling; magnetic separators and protectors.

Mammut Werke, Nürnberg.—Milling machines, universal lathes.

Maschinenfabrik Carl Hurth, München.—Gears of all sizes and types for the manufacture of machinery and automobiles, automobile parts and parts for internal-combustion motors.

Maschinenfabrik Kappel A-G., Chemnitz-Kappel.—Universal milling machines; horizontal and vertical high-speed lathes.

Maschinenfabrik Lorenz, Ettlingen.—Gear cutting machines, milling machines of various types and sizes, worm gears, drop hammers and eccentric presses.

Maschinenfabrik Oberschönweide Akt.-Ges., Berlin-Oberschönweide.—Turret lathes and turning lathes of medium and heavy size, gear cutting and shaping machines, milling machines, hydraulic presses, centrifugal pumps, compressed-air tools of all kinds with complete air-compressor equipment.

Maschinenfabrik Pekrun, Coswig i/Sachsen, near Dresden.—Three manufacturing divisions, comprising heavy milling machines for precision work; reduction gear "Pekrung," helical gears and ordinary cog-wheel drives; axles for automobiles; hardening and smelting furnaces.

Maschinenfabrik Weingarten, vorm. Heinrich Schatz A-G., Weingarten, Württemberger.—Shears for sheet iron, tin, sheet steel; shears for trimming and cutting circles, curves, and angles of all sizes; drawing presses for sheet steel.

Otto Melber, Schnittwerkzeugfabrik, Esslingen.—Dies and cutting tools.

Mikron G.m.b.H., Werkzeug- und Werkzeugmaschinenfabrik, Berlin S. 59, Hasenheide, 5-6.—The specialty of this company is the production of highly sensitive micrometers, for measuring inside and outside diameters, bolt and screw testing calipers.

Mold-Werke Akt.-Ges., Chemnitz.—Electric welding apparatus.

Morsbach Schmirgelwerk, Ohligs, Rheinland.—Buffing and polishing machines for hardware stores and professional polishers. Model A is especially adapted for the polishing of hollow-ground razors and spoons; Model B, for small metal parts for machinery; Model C for hardware stores, etc.

Peter Friedr. Mühlhof, Remscheid.—Twist drills and milling machines.

Pharosfeuerstätten G.m.b.H., Hamburg.—Portable hardening furnaces.

E. Piechatzek, Berlin, N. 65. Hoists and traveling cranes.

Piltz & Sohn, Stuttgart.—Measuring apparatus for inside and outside diameters, depth-measuring devices with dial indicators.

Pscherer & Co., Werkzeugmaschinenfabrik, Leipzig.—Automatic screw machines are the specialty of this firm. The length of the screw thread can be changed and adjusted while the machine is operating. Brass screws are cut, cleaned, sorted, counted and heads properly slotted or milled, at a speed of 500 to 600 per hour.

Pumpenfabrik Urach, Urach, Württemberg.—Pumps for hydraulic presses, boiler-testing pumps, vacuum pumps, air compressors and manometers.

Raboma Maschinenfabrik Hermann Schoening, Berlin Borsigwalde.—Specialty for past 20 years of drilling machines of several types. These machines have been constructed for iron and steel building purposes, for drilling holes in ship plates, locomotive frames, boiler plates, etc.

Paul Radeke, Maschinenfabrik, Berlin, N.W. 87.—Power hammers in three sizes, of 30, 60 and 100 kg. dead weight. These hammers are made in series and can be furnished, even in quantities, on short notice. Delivery usually in four to five weeks.

Wilhelm Reh, Werkzeugmaschinenfabrik m.b.H., Deuben-Niederhäslich bei Dresden.—This firm now specializes in the construction of precision machines on the multiple production system. Its milling machines are especially noteworthy, being constructed solely from the very best raw materials, under strict elimination of all "Ersatz" materials. The spindle is of the best alloy steel, adjustable in both front and rear phosphor bronze bearings, very strong, hardened and ground. The whole machine is strongly and powerfully constructed. Of special interest is the Universal dividing-head which has an attachment for differential indexing. The dividing wheel is larger than usual in such machines, and is of phosphor bronze, which is considered an advantage by that firm. The machine is fitted with an exceptionally large and roomy tool box, which contains, in addition to the usual tools and parts used in different kinds of work, a water tank and a pump for delivering the cooling water to the work. Delivery is promised on short notice.

Hans Reisert G.m.b.H., Cöln-Braunsfeld.—Oil filtering apparatus, lubricating oils and greases.

Riebe Kugellager- und Werkzeugfabrik G.m.b.H., Berlin-Weissensee.—This firm has again taken up the manufacture of its well-known ball bearings, improving its work by the introduction and adaptation of the latest machinery. In addition it manufactures motor plows and stationary internal combustion motors for benzol and similar fuels. In its tool and machine department it manufactures milling machines. One of the new departments deals with the construction of technical apparatus.

Max Rober, Präzisionswerkzeugmaschinenfabrik, Chemnitz.—This firm makes a specially designed gear-cutting and milling machine, capable of cutting any existing type of gear, even the peculiar designs of A. E. G., Bilgram, Fellows and Maag. These machines are for the highest type of precision work, although turned out in series and in quantity. They can be used for cutting internally toothed wheels, without being designed especially for this work. They are built in so compact a way as to be able to trim off even thick layers of material, which is a tremendous saving in time.

Röhm-Gesellschaft, Präzisions-Werkzeugfabrik, Zella-St. Blasil.—Manufactures wrenches, chucks and vises. Deliveries cannot be promised in less than two to three weeks.

Ruthardt & Co., Stuttgart.—Division of measuring instruments. Its specialties are measuring devises fitted with dials, showing inaccuracies of 0.01 mm. The firm calls particular attention to the fact that one of its instruments with dial is far cheaper in actual use than the usual type of permanent gage, because of its wide range and applicability. It will serve to measure a hundred different sizes, while a gage is rarely used for more than one or two sizes. Delivery guaranteed inside four weeks.

Samsonwerk G.m.b.H., Berlin.—Turret lathes, automatic and milling machines, shaping machines and chucks.

Schmirgelwerk Dr. Rudolf Schönherr, Schleifwaren und Spezialmaschinenfabrik, Chemnitz-Furth. — Carborundum and corundum wheels for grinding metals, glass and stone, for cleaning castings, for rough grinding and for automatic polishing of large flat surfaces; honing stones, whetstones for very fine work. The firm also makes a large variety of grinding machines, and can deliver normal sizes and types on short notice.

H. F. Schnicke, Werkzeugfabrik, Chemnitz.—Two divisions are maintained—one for the manufacture of spiral springs, leaf springs, bumper springs, draw and compression springs of various kinds; and the second for the construction of cutting and boring tools for the different types of planing, boring and milling machines. Gimlets, awls and gages are kept in stock in considerable variety, and delivery can be made from stock. Orders for special sizes are filled quickly.

Schuchardt & Schütte, Berlin C 2.—This firm has greatly expanded its manufacturing facilities, without thereby restricting its original business of wholesale dealer in machine tools. Its factories are in Berlin, Neuköln, Guben and Vienna, and can supply practically every known type of machine or tool, either from its own plants, or as a sales representative of other makes.

L. Schuler, Göppingen.—Shears, presses and turning lathes.

Alfred H. Schütte, Köln-Deutz.—This form has greatly extended its scope of manufacturing machines and tools, the wholesale distribution of which was its original business. It has factories in Köln-Deutz, Köln-Ehrenfeld, Berlin, Treptow. To name all the products of this firm would be like printing a list of the machines and machine tools on the market in the whole country, although naturally it makes a specialty of some particular types. Among the late additions to its offerings are high-speed boring machines with electric drive, needle-drawing machines and a large number of automatic machines. It also manufactures machines for all kinds of grinding processes.

Schüttoff & Bässler G.m.b.H., Chemnitz.—Screw cutting machines, turning lathes.

Earl Schwemann, Bohrmaschinenfabrik, Gevelsberg.—High-speed boring machines.

Richard Specht, Coswig i/Sachsen.—Screw cutting machines.

Stahlwerk Kabel, C. Pouplier, Jr., Kabel i/Westf.—Cold-drawn and cold-rolled tool steels, silver steel, high-speed steel, screw cutting machines, gimlets, awls, saws for metal and wood, steel tube and frame steel for automobiles, bicycles, motorcycles and airplanes.

Thielicke & Co., Berlin.—Wholesale house for automatic

screw cutting and boring machines, drop hammers, planing and milling machines, lathes and grinding machines of high-grade materials.

Emil Thuy, Hagen i/Westf.—Transmission parts.

Th. Tielemann, Eisen- und Stahlwerk, Gevelsberg.—Castings in iron, grey iron, steel and tempered steel.

Titania-Werk, Berlin-Schöneberg.—Vertical boring machines, milling machines, tools and gages.

Anton Tureczeck, Berlin.—Micrometers for inside measurements.

Carl Unger, Stuttgart-Hedelfingen.—Grinding machines.

Andreas Veigel, Cannstatt.—Turret lathes.

Vereinigte Flanschen- und Stanzwerke, Hattingen.—Forged flanges for wheels, forged pieces for railroad use, dies and die-holding pieces.

Vereinigte Modellfabriken, Berlin-Landsberg.—Models of wood.

Robert Wagner, Eisenwarenfabrik, Chemnitz.—One of the largest factories in the country for the production of metal furniture and fixtures for machine shops and big factories; lockers for clothes and tools, with safety locks; tables, chairs, stools, tool boxes, etc., all of which are kept in stock, in a great variety of sizes.

H. A. Waldrich, Solingen.—High-speed boring machines.

Wanderer werke, vormals Winklhofer & Janicke A-G., Schönau near Chemnitz.—This company maintains, in addition to its famous automobile, bicycle and typewriter establishments, a department for machines and machine tools. Its specialty in this line are milling machines in various sizes, all of which are built in series, and in large numbers. The company does not undertake to construct such machines to order.

Ferdinand C. Weipert, Heilbronn.—This firm makes a specialty of turning lathes, shaping and planing machines in a number of sizes and types.

J. G. Weisser Söhne, Werkzeug-Maschinenfabrik, St. Georgen.—Several milling types of turning lathes, turret lathes, boring machines and milling machines.

Gebrüder Weissiker, Schleifmaschinenfabrik, Gera-Reuss.—For many years this firm has made a specialty of tool grinding machines and other important machine tools.

Ernst Fr. Weisspflog, Metallschrauben- und Mutternfabrik, Gera-Reuss.—Makes a specialty of supplying screws, bolts, nuts, taper pins and rivets, as well as plates of iron, steel and brass, in thickness of ¼ to ¾ inches.

Werkzeugmaschinenfabrik Gebrüder Eberle, Schönebeck an der Elbe.—Vertical boring machines of limited variety. Requires from two to three months for delivery.

Werkzeugmaschinenfabrik Gildemeister & Comp. A-G., Bielefeld.—Milling machines, turret lathes and automatic screw machines; all these machines are built in series in large quantities, and are always in stock in many sizes.

Fritz Werner A-G., Maschinen-und Werkzeugfabrik, Berlin-Marienfelde.—This firm has expanded greatly in the last few years. Formerly a specialized manufacturer of machinery for the production of rifles and ammunition, it has now become an important factor in the manufacture of all types of machines and tools, such as milling and grinding machines, turning lathes, boring and centering machines, die-sinking machines, wrenches, vises, monkey-wrenches and other tools. During the war the firm built a new factory in Marienfelde near Berlin, which is one of the finest and most modern in Germany. Delivery of most products in three to six months.

Walter Wessel, Werkzeugmaschinenfabrik, Remscheid.—This firm produces vises for precision work, in four sizes, from 60 to 200 mm. distance between jaws. A number of special types of vises are always in stock, and delivery can be made on short notice.

Wotan-Werke A-G., Leipzig.—Turning lathes, milling and shaping machines.

A Radius and Position Gage Problem

BY CARMAN GUERRERA

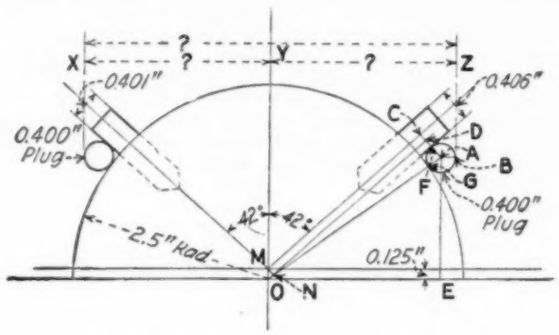
Here is a problem in the determination of a distance by means of radius and position gages which I have been unable to get anyone to solve for me.

The distance to be determined is that across the two 0.400-in. diameter plugs shown in the figure.

[Owing to the difference in diameter of the two arms of the radius gage the required distance must be obtained by two separate but similar calculations, one of which follows:

Draw *OD* parallel to *MC*, *AC* perpendicular to *MC*, *AE* perpendicular to *OE*, *AB* parallel to *OE* and connect *O* and *A*. Draw *MN* perpendicular to *OD*.

Then in triangle *MNO*, which is a right triangle, we



RADIUS AND POSITION GAGE PROBLEM

know *MO* which is given as 0.125 in. and the angle *MON* which is 42 deg. by construction. We want to find *MN*.

$$MN = MO \sin MON$$
$$= 0.125 \sin 42^\circ$$
$$= 0.084$$

$$MN = CD \quad \text{(Parallels intercepted between parallels are equal).} \qquad (2)$$

In the right triangle *ADO*, *AD* and *OA* are known. We can find angle *AOD*.

$$AD = AF + CF - CD \qquad (3)$$
$$= 0.2 + 0.203 - 0.084$$
$$= 0.319$$

$$OA = OF + FG \qquad (4)$$
$$= 2.5 + 0.2$$
$$= 2.7$$

$$\sin AOD = \frac{AD}{OA} \qquad (5)$$
$$\frac{0.319}{2.7}$$
$$= 0.11815$$
$$AOD = 6^\circ\ 47'$$

In right triangle *AOE*, *OA* and angle *AOE* are known. We can find *OE*.

$$AOE = 90^\circ - YOD - AOD \qquad (6)$$
$$= 90^\circ - 42^\circ - 6^\circ\ 47'$$
$$= 41^\circ\ 13'$$

$$OE = OA \cos AOE \qquad (7)$$
$$= 2.7 \cos 41^\circ\ 13'$$
$$= 2.031$$

$$YZ = OE + AB \qquad (8)$$
$$= 2.031 + 0.200$$
$$= 2.231$$

XY may be found by a similar calculation. Then *XY* + *YZ* is the required distance. EDITOR.]

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Gairing Service Counterbores

The Gairing Tool Co., Inc., Detroit, Mich., is manufacturing a line of interchangeable counterbores of the type shown in the illustration. The cutter is held in position and driven by a steel ball in the body of the holder that engages a slot in the shank of the

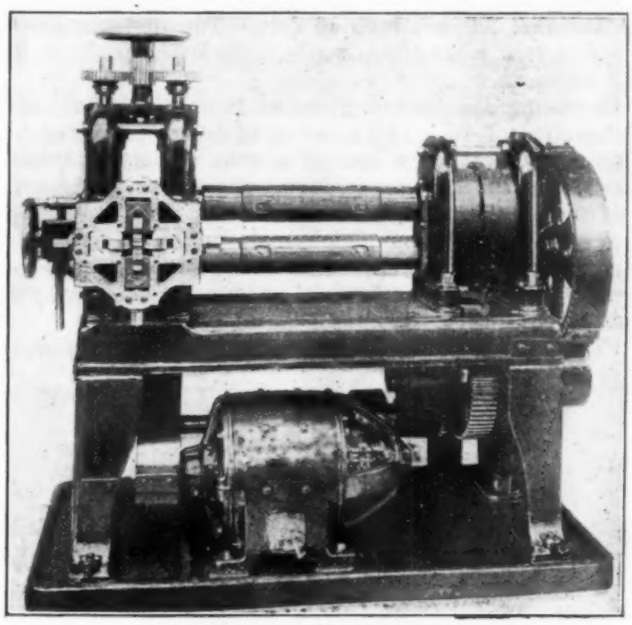
GAIRING SERVICE COUNTERBORES

cutter. The cutter can be removed from the holder by a slight turn to the left which compresses the spring and releases the ball from its seat in the slot. The floating ball with the spring pressure beneath automatically adjusts itself so that the shoulder of the cutter is always squarely against the end of the holder, thus preventing backlash or chatter. The slotted spring nut, holding the pilot in place, seats and locks itself in a 60-deg. pocket in the end of the cutter shank and prevents the pilot from becoming loose. The body of the holder having no projections of any kind, may be threaded to receive a stop collar, an arrangement that will permit a wide range of adjustments. The holders are made in four sizes known as Nos. 1, 2, 3, and 4. They will take any size of cutter from $\frac{1}{4}$ to 3 in. in diameter. Complete sets of these tools are contained in neat boxes having hinged covers. The No. 2 set is known as the fillister- and flat-head screw set, and is suitable for use for all sizes of such screws from $\frac{1}{4}$ to $\frac{3}{4}$ in. The No. 5 set includes two countersinks, fifteen cutters, thirty-eight pilots, three holders, and an assortment of pilot nuts and wrenches for same.

Standard Rolling Mill

A rolling mill designed for the high-speed rolling of wire and thin-gage flat stock is a recent product of the Standard Machinery Co., Auburn, R. I. The rolls are hollow, made of steel, and are hardened and ground. The herringbone pinions that transmit power to the rolls are inclosed in the housings and run in a bath of oil. The housings are made in halves, the joint being of oil-tight packing. Roller bearings are provided for the roll necks. A water-cooling system circulating through the bodies of the rolls keeps the surfaces cool while the machine is running at high speed. Three trains of gears are used to drive the machine. These include three fabroil pinions, one of which is attached to the motor shaft. All of the other gears, including the herringbone pinions, are made of steel and have cut teeth. The power is supplied by a 5-hp. variable-speed motor; the peripheral speed of the rolls ranges from 100 to 225 ft. per minute.

A special feature of the mill is the adjustable draw plate or Turk's head, shown at the rear of the roll housing with its cover removed. The rolls and boxes are



STANDARD ROLLING MILL

easily removable. Adjustments for different thicknesses of stock can be made by means of the four square-headed screws. These are provided with micrometer collars which permit an independent adjustment of 0.001 in. for each of the vertical and horizontal rolls. Lateral adjustment of the Turk's head, permitting the entire surface of the main rolls to be used, is made by the handwheel at the left. The main rolls are 6 in. in diameter and $4\frac{1}{2}$ in. in width, but special rolls are used to suit conditions.

The advantage in placing the Turk's head directly back of the rolls is that in this position it can be used for edge rolling and for sizing special shapes. It can also be used to some extent as a straightener. For edge rolling, the horizontal rolls control the width of the stock and the form and shape of the edges, while the vertical rolls are adjusted downward to control the thickness. The housings on each mill are planed at the front side, as well as at the back, to accommodate the Turk's head in order that the mills can be run in tandem if desired. The adjusting mechanism on top of the main housings is controlled by a single handwheel, the movement of

which operates both adjusting screws simultaneously. By removing the center pinion, the screws may be adjusted independently.

Ferracute Embossing Press

The toggle embossing press shown in Figs. 1 and 2, has recently been built by the Ferracute Machine Company, Bridgeton, N. J. The frame is a one-piece casting, the columns being set close together to minimize all possible spring. Each column is 13-in. square with a vertical 5½-in. cored hole containing a 5-in. steel bar, the combined tensile strength of columns and bars allowing for a large safety factor over the 450-ton pressure—for which the machine has been designed.

The toggles are set in the lower portion of the press and are operated by an eccentric shaft at the back as shown in the rear view, Fig. 2. This shaft obtains its motion from the large gear on its outer end, connection being made by a clutch. Pressure on the treadle causes the press to start and make a stroke, automatically stopping when a complete stroke has been made. If continuous action is desired, the treadle may be locked down.

The ram has a stroke of 2 in. The distance from head to ram, when the latter is in its lowest position, is 20 inches.

A sliding die chuck is given an intermittent horizontal motion of 10 in. by a series of levers connected to the main shaft by means of a cam. This movement causes the chuck to pause during the stroke as the embossing or coining dies come together.

The flywheel, motor pinion, main gear and its pinion are all thoroughly guarded and wire mesh is cast between the arms of the flywheel and gear as an additional safety precaution.

The head is vertically adjusted by means of a wedge that is moved horizontally, thus permitting the pressure to be transmitted through solid metal. The weight of the head is taken by a helical spring at the top of the press. Thorough lubrication of the toggles so essential in presses of this character, is provided for by numerous oil cups.

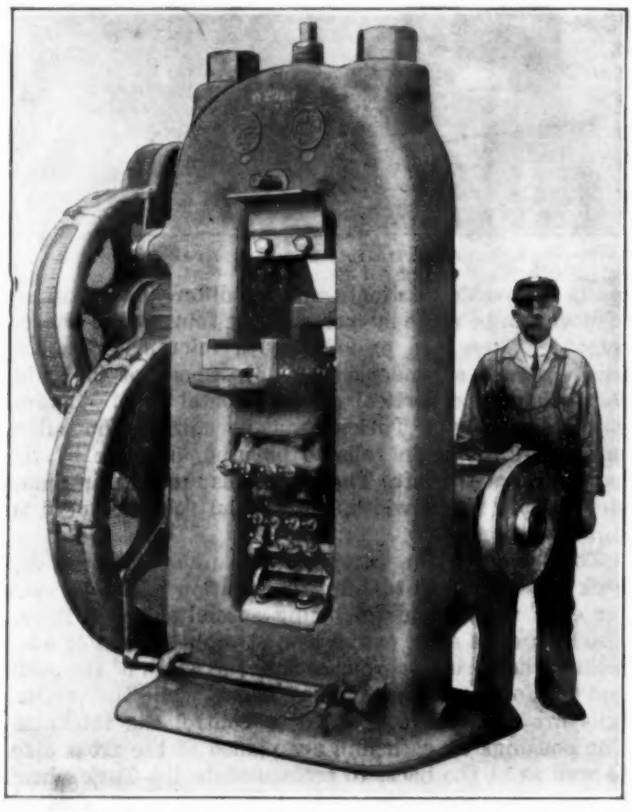


FIG. 1. FERRACUTE EMBOSSING PRESS, FRONT VIEW

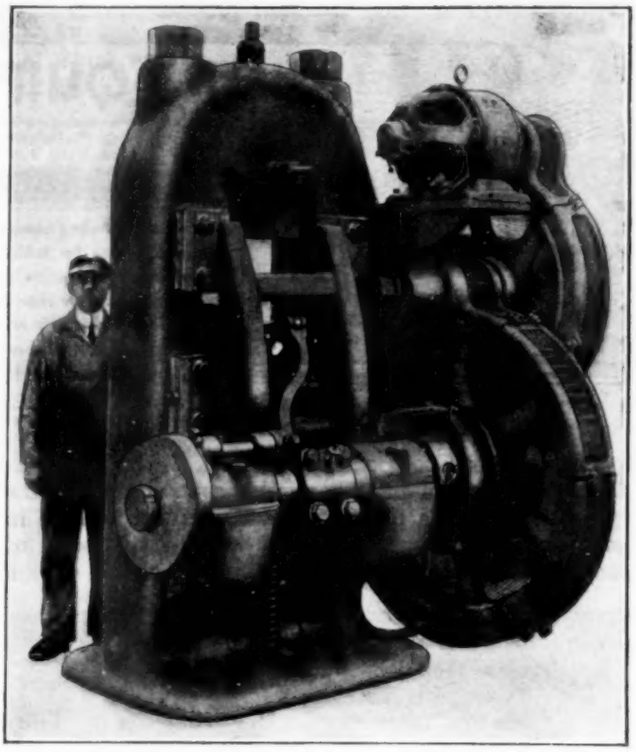


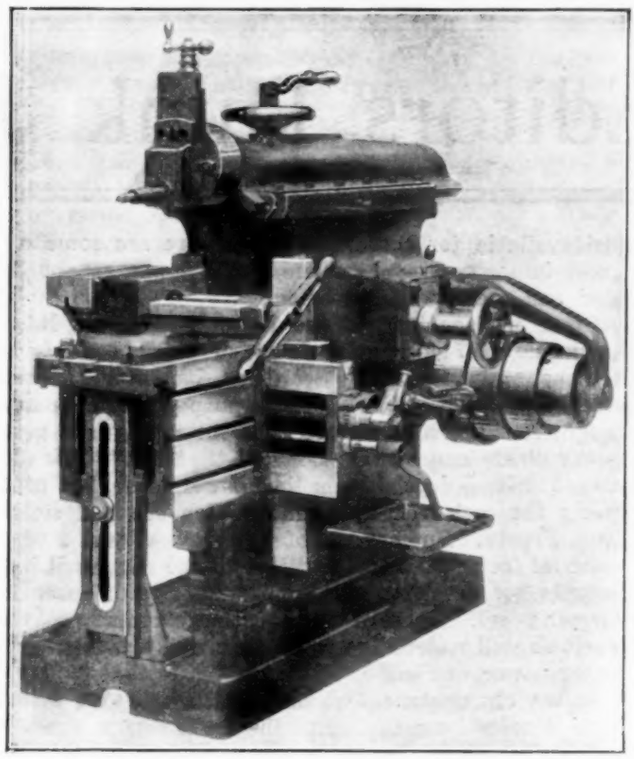
FIG. 2. FERRACUTE EMBOSSING PRESS, REAR VIEW

The press makes 30 strokes per minute. An electric motor furnishes the drive through a raw-hide pinion engaging teeth that are cut in the rim of the flywheel. The total weight of the machine is about 18,500 pounds.

Davis Cone-Drive Shaping Machine

The shaping machine manufactured by the Davis Machine Tool Co., Inc., Rochester, New York, until recently was made with gear-box drive only, but an additional model, equipped with a four-step cone drive, is now being built.

The new drive through the four-step cone pulley and double back gears, gives eight ram speeds in geometric progression, the range being from 10 to 115. The machine has the same quick-return feature and V-ways with roll oilers as the older model. The base is of heavy design and extended to accommodate the table support. The elevating screw is of the telescopic type. Quick adjustment of the ram is obtained by the handwheel at the top, and the stroke-adjusting mechanism has a dial which indicates the length of stroke set. The head is graduated and swivels through an arc of 120 deg. The down-feed screw is provided with an adjustable micrometer collar. All driving gears are cut from solid steel and are mounted on shafts which are supported at both ends by substantial bearings. The gear change is made by a conveniently located lever that slides one double gear. The regular equipment includes a heavy swivel vise, all necessary wrenches and the countershaft.



DAVIS CONE-DRIVE SHAPING MACHINE

Specifications: Planes, long 16¾ in., wide 21 in.; maximum distance table to ram, 17¼ in.; vise, between jaws, 10 in.; height, floor to ram, 40¼ in.; power down feed, 6¼ in.; size of box table, 12 x 14 in.; largest cone step, 12 in.; width of drive belt, 3 in.; r.p.m. of countershaft, 290; changes of speed, 8; size of shipping case, 44 x 61 x 68 in.; floor space, 43 x 72 in.

On special order this machine can be equipped with power down feed, swivel box table, tilting table top, circular attachment interchangeable on top of table or vertically on saddle, cone mandrel and index centers.

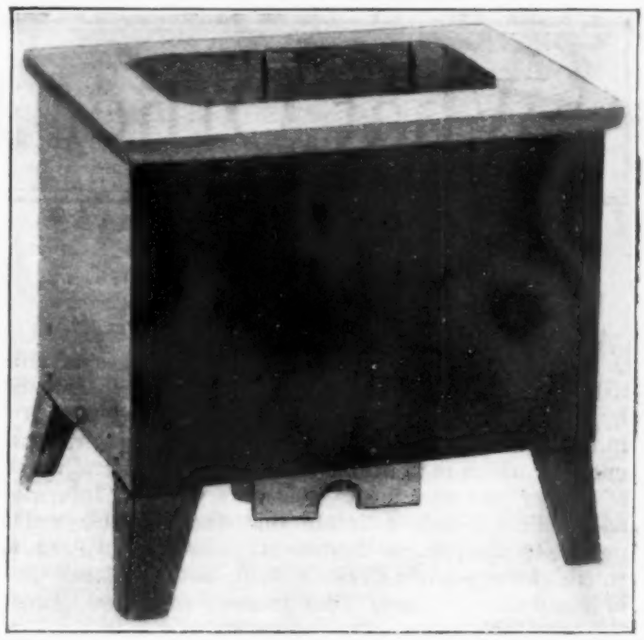
G. E. 25-Pound Bench-Type Electric Metal Melter

The General Electric Company has developed a new electrically operated device for melting lead, babbit and similar metals, known as the 25-lb. electric metal-melter bench-type pot. This device is designed to eliminate the loss of time and material, and risks of losses by fire, accidents, etc., which attend the melting of metals in a haphazard manner.

This new pot is of durable construction, having four short legs and a flange on the upper rim, so that it may either be stood on a table, or the floor, without fear of upsetting, or lowered into a hole, so as to be flush with the top of the table. It is fitted with a plug and socket fixture that can be attached to any electric-light circuit.

The heating element is a coil, wound around the container from top to bottom, and thoroughly insulated from the outside, thus insuring an even distribution of heat through the contents of the pot, and preventing temperature loss due to radiation.

The automatic regulation, which is the principal feature of the device, has been obtained by constructing the heating element of wire which has a positive temperature coefficient. That is to say, when the temperature of the heating element rises, its resistance rises proportionally, thus limiting the current and, consequently, the heat. When cold metal is put into the



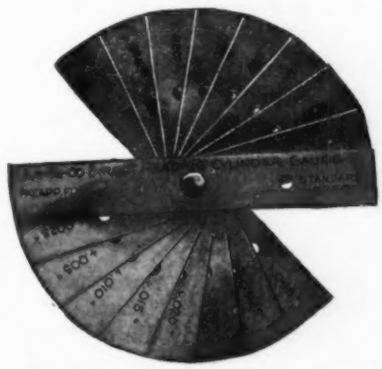
G.E. 25-POUND ELECTRIC BENCH-TYPE METAL MELTER

container, the initial rise of current is enough to melt it quickly, but, after it is melted, the current is automatically reduced to just enough to keep it molten, but not enough to burn it. This does away with the thick scum of oxidized metal around the top.

The operator may go away and leave the pot to itself when necessary without fear of wasting good metal through too much heat, or setting something on fire.

"Am-pe-co" Direct-Reading Cylinder Gage

A cylinder gage, designed particularly for the use of garage mechanics and intended as a substitute for the inside micrometer, has been introduced by the American Machine Products Co., Marshalltown, Iowa. It has the



"AM-PE-CO" DIRECT-READING CYLINDER GAGE

advantage of extreme simplicity. When measuring it is merely a matter of finding one of the nine blades to fit the bore and then reading the size that is stamped on that blade. The blade to be used is set at right angles to the others and the cylinder size is determined in the same manner as when calipering. The blades are hardened and ground and the ends ground to a true circle.

What Other Editors Think

Utilizing "White Coal"

FROM *Harvey's Weekly*

A LONG step has at last been taken toward removing one of the greatest industrial reproaches of this nation. The water-power bill which has been enacted by substantial majorities may not be an ideal measure, in all its details. It *is* an ideal measure in its principal purpose, which is to utilize the billions of dollars' worth of energy now running to waste every year. Informed and judicious men estimate that the available water power of the United States at present unutilized is worth, at present prices of fuel, not less than five billion dollars a year. That is more than three times the value of the coal now consumed.

It is a strange thing that throughout most of the country this enormous potentiality of nature's forces has been so largely neglected. In part it has been, no doubt, because of conflicting claims to the use of streams, which needed to be determined by legislation. That is a need which, we may hope, will be sufficiently met by the bill just passed. But there has been another reason, anterior to that; foolish in the extreme, yet undeniably potent. It was the notion that water power was a primitive form of energy, unworthy of an up-to-date people, and that it should be discarded along with the stage-coach and the sailing ship. It is true that it is a very ancient device. But it is also true that in its utilization it employs some of the very latest and most striking inventions of human ingenuity, in turbines and in electric plants for transmission to a distance.

This latter is one of the most important of all considerations. Formerly it was possible to use water power only at the very spot where it was generated, and it was very frequently the case that it was impracticable to use it there. Factories could not be built and operated in the remote places where nature had provided cataracts. And the use of water power for anything more than turning mill wheels was undreamed of. But now, with practicable methods of transmitting power to considerable distances without great loss, a stream in an uninhabited wilderness may drive the machinery of mills many miles away, or run the street cars and lighting plants of a distant city.

In one important respect water power differs from most other natural resources. That is, its inexhaustibleness. If we burn a million tons of coal, it is gone forever, and we shall have just as much less to draw upon. But if we use in one year the 300,000,000 hp. that experts tell us can be developed from streams, we shall have just as much the next year, and the next, and so on forever. In a sense, therefore, there has been no waste in letting the streams flow unutilized. For all the millions of horsepower thus neglected, we are no poorer. We have just as much left. But there has been a great loss from that neglect in the depletion of our coal supply. Had we utilized the water, we should now have hundreds of millions more tons of coal available for those uses—for there are some, of great importance—for which water power cannot be used and coal is indispensable.

Other nations learned the lesson long ago. Italy, having no coal, long ago made use of "white coal" from her mountain streams. Secretary Lane told us the other day that "Far-sighted, purposeful Germany fought four and a half years upon the strength of gear power plants run by the snows of the Alps." She did not, it is true, depend upon that power alone, but used freely the coal from the mines which she had stolen from France. But her use of water power was a very material factor in her prosecution of the war, as it had been in her development of the industries of peace in former years. There is no other large country in the world so well watered as ours, or so well provided with water power.

In any circumstances we should utilize it. We should have done so long ago. But the lessons of the recent coal strike are unmistakable, and were decisive in moving Congress to the long-delayed action which has just been taken. A few weeks ago we were exclaiming in indignation at the spectacle of people suffering from cold and from stoppage of industries, when the coal they needed was lying in the ground at their feet. It is a comparable spectacle to see them thus suffering when the physical energy which would supply their needs is flowing unutilized downstream, past their cities, to the sea. If now the country shall take full advantage of the opportunities afforded by the new law, another coal famine, if ever it occurs, will be robbed of more than half its terrors.

Every Man an Efficiency Engineer

FROM *Power*

JOHN LEITCH in his excellent book, "Man-to-Man, the Story of Industrial Democracy," relates that in one plant at a meeting of the employees the suggestion was made by one that an efficiency engineer be called in to instruct the men in better methods for doing their work, and to increase production. Much discussion followed, and finally one of the men blurted out, "We have 268 efficiency engineers right here now!" (There were 268 employees in the plant, and they were all present at the meeting.)

There is a tremendous amount of sound reasoning and good judgment expressed in that short statement, and it should be true of every plant. When by instruction and co-operation each man is induced to take the interest that he should in the plant in which he is employed, then each man will become an efficiency engineer. It will be unnecessary to call in outside aid to find the weak spots, and to devise better methods of doing things. No man can be as familiar with the workings within a shop as he who spends day after day at his bench, at his lathe, or on whatever his job may be.

Every workman should constantly keep before his mind these three questions:

Am I doing my work in the most economical way for the interests of my employer? (Which, by the way, generally prove to be the employee's interests also.)

Am I eliminating all possible wastes of time, energy and material?

Am I doing everything possible to advance myself in my work, both to my own profit and for the interests of my employer?

If a man can answer "yes" to all these questions, then however humble may be his position, however rough and unskilled may be his labor, that man is an "efficiency engineer," and as such a most valuable asset to his employer. On the other hand, the reverse is true. Any man, no matter how high a position he may hold, who can not answer "yes" to the foregoing questions not only is depriving his employer of services that are his due, but is decreasing production, increasing costs and—what should be of more interest to him—retarding his own development and advancement. And it is such men that make it necessary to bring in efficiency experts from the outside.

The profession of efficiency engineering has been greatly abused, until in many plants an efficiency engineer is looked upon with suspicion by employer and employee alike. The mere use of the words arouses a feeling of hostility at once. This works a hardship upon the great number of men who are qualified by training and ability to give expert advice in matters of cutting costs, increasing production and reducing wastes, and who have made this work their profession.

But if the employees of every plant, large or small, would adopt for their motto the words, "Every Man an Efficiency Engineer," there would be no occasion for outside experts to be called in. Labor and capital would alike benefit thereby, fuel administrators would be unnecessary, and power plants would operate at efficiencies heretofore unheard of.

Stolen Trade Marks

FROM *Automotive Industries*

IT IS interesting to note the interest created among manufacturers of automotive vehicles by a newspaper dispatch printed during the New York show, stating that an enterprising Portuguese automobile tradesman had taken advantage of the trade-mark laws to register in several European countries the trade marks by which forty-three American cars are known. It is probable that this man is patiently waiting for some of the American manufacturers to ask him his price to sell them what should be their own rights.

Some of the makers were amazed at this turn of affairs, but there is little reason why they should be even mildly surprised that they have been robbed of their rights. It certainly was not because they have not been warned. Speaking for *Automotive Industries*, we can say that repeated warnings have been given as to the liability of a copyright to be stolen, and we have told many times of similar, if less extensive, robberies of this kind. Also these columns have pointed out many times the way by which the manufacturer could protect his trade mark at a nominal expense.

The trade-mark specialists have advertised extensively to obtain customers for their service and they have taken very good care of those who became their clients. But there were many manufacturers who were actually selling cars abroad who did not protect their trade marks. Some manufacturers, despite warnings, permitted their agents abroad to register their trade marks and when the occasion arose to change agents, they found that they could not because the smart agent had registered the trade mark as his own. Of course, this involved a settlement and some have been costly.

Just as a word of warning, we might say to any manufacturer who has not registered his trade mark abroad, or whose trade mark has not been stolen: ACT AT ONCE.

[The *American Machinist* also has published numerous articles concerning the use and protection of trade marks.—EDITOR.]

Profit Sharing

FROM *Mechanical World*, ENGLAND

THE significance of the number of profit-sharing schemes which are being launched just now should not be missed, and engineering firms are by no means the least prominent in this movement. The primary idea—indeed, fundamentally, the sole idea—is of course to give the worker that same interest in the business or firm in which he is engaged, as the capitalist and the shareholder. Profit sharing has had a somewhat chequered career, in which outstanding successes and outstanding failures appear. At root, the principle is the right one, and only prejudice has prevented its more rapid expansion.

The attitude now being taken by employers seems to be to outline a scheme which in the first place provides for the payment of full trade-union rates of wages. That should essentially sweep away trade-union prejudice, on the ground that the share in profits is offered in lieu of wages. That objection has often been made, although we are not aware of any scheme of which that is a principle.

The employers in recent schemes, therefore, are, so to speak, unconcerned as to what attitude the unions take, for if a workman, after receiving his recognized wages, is offered something more as a share of profits, he may refuse it if he likes. Schemes on this basis are likely to meet with the approval of the more level-headed of workmen, although there is the drawback that the man who does not put himself out to do more than a minimum amount of work gets the same share of the profits as the man who puts his heart into his work.

Class Privilege

FROM *Harvey's Weekly*

WE BELIEVE that there is nothing more odious in a democracy than class privilege. Wars have been fought to destroy the detested thing, and they have been righteous wars, and successful. There was once a parochial political boss who defied a writ intended to prevent him from corrupting an election, with the cynic sneer, "Injunctions don't go here!" But he himself did speedily go—to prison. There was another, a conspicuous labor leader, who similarly defied injunctions; who is at the present moment serving a long term in the penitentiary. It is a dangerous thing to defy the common law of the land, and to claim for individuals or for classes immunity from the penal code. There is room in the United States for only one system of law and justice, with equal and impartial jurisdiction over all men.

Sparks from the World's

By E. C. Porter,

Navy Offering Surplus Materials for Sale

The United States Navy is offering for sale large quantities of metal bar stock, steel in commercial sizes, copper and brass tubing and bolts and nuts which have been declared surplus for Navy needs. Included in the material available for sale are 16,000 tons of commercial steel. All of the material offered by the Navy has never been used.

The disposal of the steel, copper and brass, and other surplus material of the Navy Department is in charge of Commander C. G. Peterson, director of the Board of Sales, Division of Supplies and Accounts, Washington, D. C.

The surplus supply, which is located at various naval stations, is being offered for sale at current market prices. Detailed information may be obtained from the Washington office or naval stations at the following points: New York, Boston, Philadelphia, Norfolk, Va., Charleston, S. C., and Great Lakes, Ill.

Consolidation of Electric Welding Companies

Associated Welding Companies, Inc., is the name of a new corporation being effected that will include the consolidation of the following companies: Electric Welding Company of America, New York; Electric Welding Company of America, Baltimore; Electric Welding and Shipbuilding Company of Canada, Montreal; Electric Welding Company of America, Portland, Me.; Electric Welding Company of Boston, Boston; Brooklyn Electric Welding Company; New York Electric Welding Company; Electric Welding and Ship Repairing Company of Pennsylvania; Electric Welding Company of America, Norfolk, Va.; Ohio Welding Company, Cleveland; Electric Welding Company of the Argentine, Buenos Aires; Compañia Soldatura Electrica de España, Bilbao, Spain; Brooklyn Ship Repair Company, Brooklyn. The main office of the new corporation will be in Brooklyn.

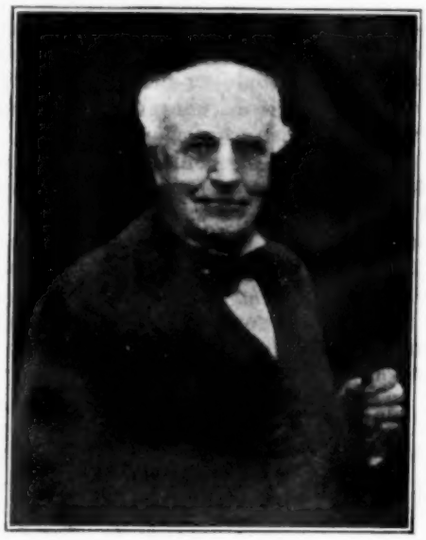
Seventy-Third Birthday of Thomas A. Edison

Yesterday, Feb. 11, 1920, was the seventy-third birthday of Thomas A. Edison, the inventor and pioneer, who has done so much to make this the greatest electrical period in history.

Mr. Edison started his electrical career as a plug operator sixty years ago and today his great achievements are shown by about 1,500 United States patents of which 500 at least have been "master" or remain "controlling."

It is impossible to estimate the total contribution to the wealth, happiness and prosperity of the world of this great American electrical engineer who is the inventor of the phonograph, the founder of the motion picture industry and a leader in domains so widely apart as chemistry and cement making.

At the outbreak of the world war Mr.



THOMAS A. EDISON

Edison patriotically offered his services and was appointed head of the Naval Consulting Board. He devoted himself quite largely to military and naval problems such as those connected with the suppression of the submarine boat.

Mr. Edison has received innumerable degrees and marks of recognition, the latter including the Albert gold medal of the Royal Society of Arts of England and the John Fritz gold medal of the four national engineering societies of America. The Edison gold medal was founded in the American Institute of Electrical Engineers in 1904 and has since been awarded to several great electrical engineers and scientists. Various organizations bear his name, notably the Association of Edison Illuminating Companies. In 1918, on his birthday, the Edison Pioneers, whose membership is composed of men associated with him in his work and enterprises up to 1885, was founded. Mr. Edison is a member—honorary in several instances—of a great number of societies, and though in no sense a club man, is an honorary member of the Engineers' Club of New York.

Koehring Company Opens Three Southern Offices

The Koehring Machine Company, of Milwaukee, it is understood, will open offices in Atlanta, Jacksonville and New Orleans under the name of the Atlantic Equipment Company.

The Atlanta branch will handle the Koehring line of concrete pavers, mixers, loaders and sifters, together with other lines of concrete equipment. A service department will be maintained, which will keep in stock repair parts and machinery.

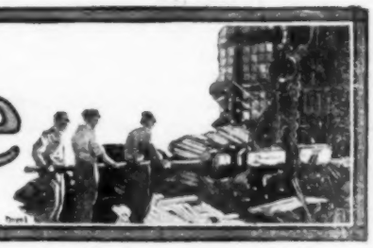
N. A. Coulter has been named manager of the sales department and will be actively in charge with headquarters in Atlanta. The New Orleans office will be represented by Tom E. Foster and Warren Shankle. S. P. Galley and W. S. Ansley, Jr., will have charge of the Jacksonville office.

Steinmetz Motor-Car Corporation

The Steinmetz Motor Car Corporation, with executive and sales offices in the Ziegler Building, 512 Fifth Ave., New York, has been chartered under the laws of the State of Maryland with a capital of $2,000,000 to manufacture a new type of light-weight electric delivery truck and an improved electric industrial car for use in manufacturing plants. Both cars are the invention of Dr. Charles P. Steinmetz, chief consulting engineer for the General Electric Company, Schenectady, N. Y. Dr. Steinmetz will act as consulting engineer to the Steinmetz Motor Car Corporation and is a member of its board of directors. The company has acquired a manufacturing plant at Baltimore, Maryland.

The officers of the corporation are: A. Robert Elmore, president; J. P. Story, Jr., vice president; Nelson H. Truett, secretary and treasurer. The board of directors includes: Herbert A. Wagner, president Consolidated Gas, Electric Light and Power Co., Baltimore, Md.; William F. Ham, president Washington Railway and Electric Co., Washington, D. C.; Lindsay Hopkins, banker, director American Hide and Leather Co., vice president and director Santa Cecelia Sugar Co.; A. Robert Elmore, banker, of Moorehead & Elmore, Washington, D. C., members New York Stock Exchange and president Universal Body Co.; Guy Scott, president Continental Trust Co., Washington, D. C.; J. P. Story, Jr., of Story & Cobb, Washington, D. C., director American Hide and Leather Co., director Commercial National Bank, Washington, D. C., and Charles P. Steinmetz.

Industrial Forge



News Editor

Progress of the American Engineering Standards Committee

After three years of painstaking investigation and discussion by the engineering fraternity, and under the guidance of Prof. Comfort A. Adams as chairman, the revised constitution of the American Engineering Standards Committee, along with the by-laws and rules of procedure, has been adopted, and has been ratified by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials, and the three Government departments — Commerce, Navy and War. Each of these interests has three representatives, and although the committee as it exists today consists of twenty-four members, the new committee is of very wide scope and allows the direct or indirect participation of anyone interested in standardization.

On account of other affairs, Professor Adams has given up the chairmanship, but he will give the committee his full support as a member.

A. A. Stevenson, the newly elected chairman, is a past president of the American Society for Testing Materials, and has been officially and actively interested in standardization work for many years.

C. B. LePage, who volunteered to act as secretary during the organization period, was unable to continue the work and has resigned, and Dr. P. G. Agnew, formerly of the United States Bureau of Standards, is now permanent secretary with headquarters at the Engineering Societies' Building, 29 West Thirty-ninth St., New York.

Objects of the Committee

The American Engineering Standards Committee makes it possible to give an international status to approved American engineering standards and to co-operate with similar organizations in other countries. Similar organizations are now functioning in Great Britain, France, Switzerland, Holland and Canada.

Through the new committee the methods of arriving at engineering standards will be unified and simplified, and by co-operation the duplication of standardization work will be prevented. Standards will not be created without giving all interested an opportunity to participate.

The "approval" of a standard by the American Engineering Standards Committee does not mean that the committee has itself worked over and approved each detail, but rather that the work has been carried out by a sectional committee adequately representing the industry concerned, and sponsored by one or more bodies of ability, experience and standing, so that the result may stand for what is best in American engineering practice.

What the Committee Is Doing

The American Engineering Standards Committee is not only ready for business, but it has made considerable practical headway. It has approved specifications for standard pipe threads, for which the American Society of Mechanical Engineers and the American Gas Association are sponsors, and are representing America on this subject at an international conference in Paris. Co-operation is in progress with the National Screw Thread Commission, authorized by Congress and composed of representatives of the various technical societies, looking forward to standard screw threads. Through this arrangement, direct co-operative work with the British, which is not possible by the official commission, is being carried out. The committee is also in active co-operation with the Canadians on bridge specifications, with the British on specifications for machine tools, and with the Swiss on specifications for ball bearings. In each case the detailed work is being carried out by sponsor bodies by means of sectional committees.

A large conference, in which are practically all national organizations interested in industrial safety, has unanimously voted that all industrial safety codes should be prepared under the auspices of the American Engineering Standards Committee.

Now that the organization of the committee has assumed such definite and precise form, no doubt its activities will be greatly extended and accelerated.

Incorporation of Automobile and Motor-Car Concern

The Dusenberg Automobile and Motor Car Co. has incorporated under Ohio laws for $15,000,000.

Officers of the new concern are L. M. Rankin of Kansas City, Mo.; Newton Van Zandt of Revere, Ind.; and the Dusenberg brothers, Fred and Otto, who designed the motor bearing their name.

Cleveland capital is interested in the enterprise, and it is reported that a plant will be constructed in East Cleveland to turn out 1,500 cars yearly.

Trade Currents From New York, Cleveland and Milwaukee

New York Letter

Increased activity in many lines has strengthened the tone of the local machine-tool market in contrast to the quietness prevailing during the past week.

Heavy equipment is booking up after a somewhat inactive movement. Machine-tool men report a constantly increasing demand for the larger units, but state that no falling off in the sales of small equipment is noticeable in consequence.

The demand for wood-working machinery still continues heavy with a promise of becoming even more so. In used-tool circles, trade is exceptionally brisk, but new equipment is restricted in sales volume only by delivery.

Deliveries quoted last week at 30, 60 and 90 days have been set back to June and July, with a large number of orders scheduled for delivery during the last quarter of the year. It looked as though deliveries would ease up considerably, but latest reports seem to dispel whatever hopes machine-tool men may have had of quoting their customers early delivery dates.

Industrial building in and around New York is running largely to activities that use machine tools extensively with New York as their source of supply.

The Excelsior Motors Corporation at Orange, N. J., is to engage in a general automobile manufacturing business with an initial capital of $125,000.

Newark gains four new plants with a combined capital of over two and one-half million dollars. The National Auto Products Company, with a capital of $2,000,000, heads the list. It will manufacture a general line of auto parts and accessories.

The Cutlery Specialty Company, with a capital of $100,000, will operate a plant for the production of high-grade cutlery, and the Bender Manufacturing Company will locate in Newark with a plant capitalized at $250,000 to produce iron and steel products.

Coal-gas producers will be manufactured by the Gas Producer and Engineering Corporation which has filed capitalization figures of $200,000.

These industries will buy in the New York machine-tool market.

As March 1 approaches, the machine tool trade is anticipating an influx of large orders, but until these material ize, business will continue on a basis of small sales in large numbers.

Cleveland Letter

A change for the better has manifested itself in the northern Ohio machine-tool situation.

Although orders are limited, generally, a large number has resulted from inquiries placed some time back. The sales volume has increased to some extent, and this is taken as an indication that general manufacturing interests and the automotive industry are about to carry out expansion programs planned in the latter part of 1919.

The increased demand for machine tools has been sufficiently sudden to cause uneasiness among dealers as to deliveries. Consumers have taken lightly the warnings of the machinery men that deliveries will be slow and uncertain, and are inclined to think that thirty- to sixty-day deliveries will prevail. When it is impressed on the consumer that June and July are really favorable delivery dates, confusion is bound to result to the annoyance of all concerned.

Skilled and unskilled labor is scarce in machine-tool plants of the northern Ohio district. One large concern states that it needs at least 300 more men to keep up to schedule. This has its effect on deliveries.

Two large orders for special machine tools, $100,000 and $200,000, respectively, were encouraging features of the week. From appearances, sufficient business has been booked by manufacturers to warrant heavy expenditures for new equipment.

Prices here, as elsewhere, have gone up an average of 10 per cent all around, and this, also, is a factor in influencing sales before further rises.

As usual, the bulk of machine-tool orders is drawn from northern Ohio industries and Detroit, but a significant hint of expansion comes in the shape of an order from Mexico for $10,000 worth of glass-molding machinery.

Milwaukee Letter

The general prosperity in the machine-tool industry continues. Buying has been active for some of the new plants which will be located in Milwaukee and nearby. Dealers are having increasing difficulty in obtaining satisfactory delivery from sources of supply. Dates promised on many of the larger machines will be in the neighborhood of six months for the earliest delivery.

The automobile industry will have a large accession when the new Milwaukee plant of the Nash Motors Co. is completed. The work on this plant is progressing and the company expects to begin making delivery of finished cars in the early summer. Purchases of tools and equipment for this plant are rapidly being made. Other automotive plants are said to be planning to locate in this vicinity in the near future.

One of the large machine-tool builders of this district has just announced an increase of approximately 14 per cent in the price of his machines. This is one further instance in answer to those who thought that the prices of machine tools had been unduly inflated by the war conditions, and that after times had become more normal there would be a big slump in prices. While the present prosperity is adding its share to the profits of the industry, it is probable that the ease in doing and getting new business is at present holding down the overhead expenses to such an extent that no more price increases can be expected.

The Machinery Outlook at New Orleans

Machine-tool and general-machinery business in the New Orleans district is reported good, with every prospect of continuing for months if not years to come. This district it must be remembered reaches into the Texas oil fields as well as eastward to Mobile and its shipping. While, as yet, there are no large machine manufacturing plants as we know them in the North, the diversified interests make a steady demand in what may be called staple markets of the world—sugar, cotton and rice. All of these are seasonal; yet they constitute a trade which may be depended on year after year.

Add to these the development of the oil industry in northern Louisiana and Texas, the huge shipping trade of New Orleans—claimed to be the second port in the U. S. A.—and you have a market that is diversified enough to remain fairly stable.

Here is built much of the sugar machinery, not only for this district but for the Cuban sugar fields. The Dibert, Ross & Bancroft Company, of New Orleans, has recently supplied one of the largest sugar grinding mills ever built to a huge sugar plantation in Cuba. This will represent a shipment of over a million pounds and has a capacity of over 3,000 tons of cane per day.

Other and smaller shops make various parts of sugar equipment such as extractors, pumps, etc. These shops have comparatively little equipment in the way of machinery, but are well supplied with the mechanics who know how to get out work without special machinery. Those who only keep in touch with our highly organized and specialized shops, such as we find in the automobile, gun and typewriter industries, should visit this section and see what is accomplished with comparatively few machines and with improvised tools and methods.

The question of skilled men becomes vital, however, in the rush season, when large sugar-mill machinery has to be built in time for the next season. Then it becomes necessary to recruit additional labor from other industries, such as the shipyards or ship-repair shops and the railroads—for this work requires all-round mechanics who can handle almost any kind of work. The operator who may be skilled on only one machine is of little use. The shortage of skilled men is felt here as elsewhere, all agreeing that we have not trained enough good mechanics during the past ten years.

Here, too, we find the question of insufficient production, of the failure to secure the full co-operation which can alone give us the production we need. This only emphasizes what has already been pointed out in various ways. Production, or the lack of it, is not so much a matter of geography or the kind of work as it is the way in which the matter of personnel relations is handled by the management. It is the growing belief that we have neglected this, the most important element in production, while devoting all our efforts at improvement toward the mechanical end.

Machinery dealers in the New Orleans section consider that this district has a most promising and stable future, even without the establishment of large manufacturing plants.

Bill Will Give Protection of Trade Marks and Commercial Names

Ratification of the Pan-American trade-mark and trade-name convention by the House makes it practically certain that this convention will be authorized in the very near future since an identical bill was passed by the Senate at the last Congress.

This convention makes it possible on the payment of a $50 fee for American manufacturers to secure protection for their trade marks and commercial names in all Latin-American countries. At present, it is necessary for American manufacturers to register their trade-marks in each country separately, entailing large expense.

The discussion of the bill in the House brought out that further patent legislation looking to greater efficiency in the handling of patents, and establishing a court of patent appeals, is about to be reported out of committee.

Tool Companies Merge

The Williams Tool Corporation, organized under the laws of Delaware, has acquired the business, plant and manufacturing assets of the Williams Tool Company, Erie, Pa. The principal product of the latter company has been for eighteen years the Williams' pipe-threading machine.

Portable Engine Cranker

A portable engine cranker designed and built under the supervision of the Equipment Section, Engineering Division, McCook Field, Dayton, Ohio, was successfully demonstrated recently. The design allows for the cranking of engines mounted in various airplanes, ranging from the Curtiss training plane to the Martin bombing types, on rough and uneven ground. The outstanding feature of this cranker, it is reported, is that it will accommodate all right-hand engines fitted with a standard hub, not mounting a spinner. It develops a starting torque 50 per cent greater than that necessary to turn over a cold Liberty "12."

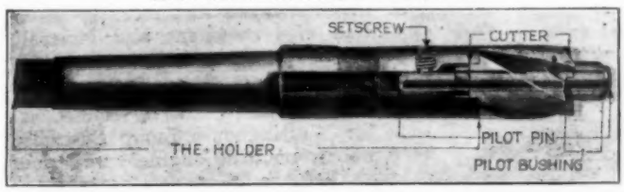
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Counterbore, Cost-Cut

The Cost-Cut Counterbore Co., 74-78 Fort St., East, Detroit, Mich.

American Machinist, Dec. 18, 1919

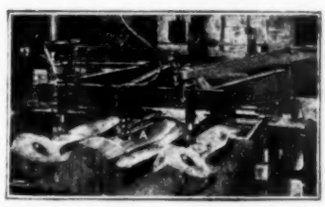


This tool is made up from the five following pieces: holder, cutter, pilot pin, pilot bushing and setscrew. Holders are made in five sizes with a selection of taper shanks for each and will carry cutters ranging in size as follows: No. 1 holder—Morse taper Nos. 1 or 2; range of cutters, $\frac{1}{4}$ to $\frac{11}{16}$ in. No. 2 holder—Morse taper Nos. 2 or 3; range of cutters, $\frac{3}{4}$ to $1\frac{1}{16}$ in. No. 3 holder—Morse taper Nos. 2 or 3; range of cutters, $1\frac{1}{8}$ to $1\frac{5}{16}$ in. No. 4 holder—Morse taper Nos. 3 or 4; range of cutters, $1\frac{7}{16}$ to $2\frac{1}{16}$ in. No. 5 holder—Morse taper Nos. 3, 4 or 5; range of cutters, $2\frac{1}{8}$ to 3 in. or over.

Shaping Machine, for Propellers

Keller Mechanical Engraving Co., Brooklyn, N. Y.

American Machinist, Dec. 18, 1919

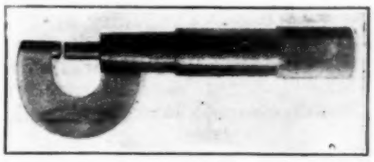


This machine has cut to size from the rough fifty propellers in $8\frac{1}{2}$ hr. One blade of each propeller is being worked on and when these are finished the propellers are given half a revolution, presenting the other blades to the cutters. For finishing the other sides of the blades, the propellers will be turned over. At the rear is an extra fixture on which a model and one propeller are mounted. When the propellers on which the machine is working are finished, the work table will be shifted along to bring the fixture at the rear into the working position and the fixture with the finished propellers will be unloaded and again loaded while the machine is at work.

Micrometer, Lindquist Ten-Thousandth

The Lindquist Engineering Works, Portland, Conn.

American Machinist, Dec. 18, 1919



The barrel is graduated forty divisions to the inch for a distance of $1\frac{1}{4}$ in. The extension is threaded, 40 pitch. Beveled edge of the thimble is graduated to fifty divisions.

Measuring spindle is splined to frame. Its outer end is threaded fifty pitch and screws into an inner sleeve which turns with the thimble. When thimble is turned forward one full turn it advances 1/40 or 0.025 in. and at the same time withdraws the measuring spindle into inner sleeve 1/50 or 0.020 in., leaving an actual advance of spindle equal to the difference in pitch, or 0.005 in. One division of the thimble equals 0.0001 in. Total range of each tool is $\frac{1}{4}$ in. Made in all sizes from $\frac{1}{4}$ to 6 in.

Lathe, Stamets Gun-Boring

Wm. K. Stamets, Jenkins Arcade Bldg., Pittsburgh, Pa.

American Machinist, Dec. 25, 1919

The lathe is provided with a boring-bar unit instead of a boring bench, common to lathes of this type. A rack and pawl provide means to resist the thrust of the boring tool. Motors are controlled by handwheels. The machine as shown, is 100 ft. in length and weighs 1,700 lb. per foot. The drive motor is 35 hp.; quick-traverse motor, 10 hp.; circulating pump motor, 5 hp. Other approximate specifications are: Swing, 55 in.; width, 8 ft.; height, 9 ft.; approximate weight (100-ft. bed), 85 tons; extra weight per foot of bed, 1,500 lb.

Compressor, Electric Air

Black & Decker Manufacturing Co., Baltimore, Md.

American Machinist, Dec. 18, 1919

Has a capacity of 6 cu.ft. per minute at a pressure of 200 lb. The motor, engine, gearing, etc., are completely inclosed in a single housing, which is removable in three sections. The machine is air-cooled, and it is said to run 24 hr. continuously against 150-lb. pressure. The electric equipment can be furnished for direct current at 110 or 220 volts, or for alternating current, two- or three-phase, at 220 volts. Another outfit with a larger engine but the same design, known as No. 412, has a capacity of 12 cu.ft. per minute at 75-lb. pressure. This outfit is recommended by the makers as especially suitable for pneumatic tools, paint-spraying machinery, blowing flame work, etc.

Boxes for Carbonizing and Annealing

The Quigley Furnace Specialty Co., 26 Cortlandt St., New York.

American Machinist, Dec. 18, 1919

A line of steel boxes for carbonizing and annealing. It is claimed that these boxes are made of special analysis steel, known as Q-steel, which gives maximum resistance to oxidation coupled with minimum cost per heat hour of service.

Grinding Machine, Plain

Wadkin Mills & Co., Ltd., Nottingham, England

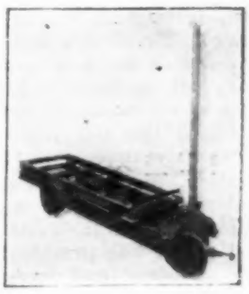
American Machinist (English Edition), Dec. 13, 1919

Swing, 6 in. in diameter as a maximum, or 4 in. in diameter over the steady, by 20 in. long. The crossfeed is 5 in., the five table speeds ranging from 27 to 166 in. a minute and the five work speeds from 51 to 316 r.p.m. The grinding wheel is 12 in. in diameter by 1 in. wide by 5 in. hole, and will wear down to 7 in. in diameter; its speed is 1,900 r.p.m. Also the table swivels to an included angle of 10 deg. While the maximum diameters are as stated, the machine is thought to be specially suitable for finishing work up to about 3 in. in diameter by 18 in. long. If specially ordered a variable-change speed device can be fitted, giving all the intermediate speeds and travels within the range of the machine, the change being affected by handwheel, while a dial shows the speed of the work and the travel of the table. The floor space occupied is about 82 x 49 in., and the machine weighs 21 cwt.

Truck, Combination Lift and Trailer

Barrett-Cravens Co., 169-73 Ann St., Chicago, Ill.

American Machinist, Dec. 25, 1919



These trailer trucks are built in all models in which lift-trucks are supplied, have capacities of 2,000, 3,000 and 5,000 lb. with carrying frames ranging in size from $17\frac{3}{8}$ to 27 in. in width and from 30 to 72 in. in length. When in use as a trailer, the handle of each truck is automatically locked in an upright position. The front link will turn through an angle of 180 deg. and in no way interferes with the full turning radius of the front wheel. On account of the rigidity of the coupling links there is no possibility of collision between trailer trucks and no chance of piling up when the power truck stops suddenly. For the same reason the train may be started smoothly.

Business Items

The R. E. Ellis Engineering Company has opened a Milwaukee office at 1417 Majestic Building with Leslie E. Johnson as branch manager.

The Toledo Tool Engineering Co., Toledo, Ohio, has been chartered with a capital of $10,000 by E. E. LaFrance, E. R. Carroll, D. M. Grimm, F. H. Wells and D. Ray Rowe.

The Holt Manufacturing Co., Peoria, Ill., announces that it has placed its advertising account with Cleland, Inc., 48 East 41st St., New York. All inquiries are referred to this concern which will handle the entire publicity campaign.

The McCrosky Tool Corporation has opened two new branch offices: one at 621 West Washington Boulevard, and the other office at 1417 Majestic Building, Milwaukee, Wis. Frederick Fisher is in charge of both offices.

J. E. Poorman, manufacturer of machinery, has lately acquired a 76 x 114-ft. piece of property at 1820-24 Bristol St., Philadelphia, Pa., where it is expected a large machine shop will be erected, in connection with his present plant at 1825 Bristol St.

George W. Childs has opened an office in Room 701, Crozer Building, Chester, Pa. He will act as consulting engineer on power transmission, rolling mill, cotton mill and dredging machinery, machine tools, jigs and fixtures, artillery and ship construction and foundry equipment problems.

Raymond B. Jones and Eugene E. Hart, both formerly with the Dale-Brewster Machinery Co., Chicago, Ill., have formed a company to specialize in the sale of cutting tools. This company will be known as the Industrial and Railway Supply Co., with headquarters at 114 North Desplaines St., Chicago, Ill.

The General Tractors, Inc., Paulsboro, N. J., would be pleased to get in touch with concerns doing machine work, who might be interested in the manufacture of tractor parts in quantities. The company is also in the market for the purchase of materials and supplies used in connection with the manufacture of tractors.

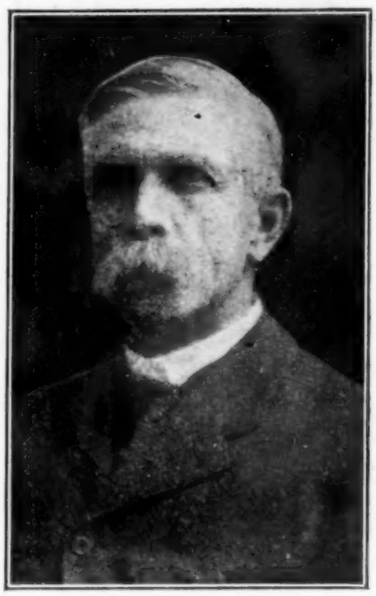
The Black & Decker Manufacturing Co., Baltimore, Md., has opened a branch office at 6523 Euclid Ave., Cleveland, Ohio, with Garth A. Dodge in charge. Mr. Dodge was formerly connected with the Austin Co., Cleveland, Ohio, and has recently joined this company to act as branch manager for the States of Ohio and Indiana.

The Dart Truck and Tractor Corporation, Waterloo, Iowa, held its annual meeting recently and elected the following officers: W. H. Johnson, M. D. Herron, vice presidents; E. L. Stover, secretary and treasurer; and S. Y. Eggert. It was voted by the stockholders to increase the equipment and assembly space of the factory.

Rimmon Colton Fay

Rimmon Colton Fay, inventor of the Fay automatic lathe, died at his home in Fox Chase, Philadelphia, on Jan. 16, 1920, in his seventy-second year after a short illness.

Mr. Fay was employed as a machinist, draftsman and contractor for Colts Arms Company, Hartford, Conn., from



RIMMON COLTON FAY

1868 to 1873, two years of that time working on the gatling gun.

Since then he has held positions as contractor or superintendent with the Fales & Jenks Machine Company, Pawtucket, R. I.; the Draper Corporation, Hopedale, Mass.; Pratt & Whitney, Hartford, Conn.; Remington Arms Company, Ilion, N. Y.; Thomas Manufacturing Company, Springfield, Ohio; Mossberg and Granville Manufacturing Company, Providence, R. I., and Schaum & Uhlinger, Philadelphia.

In addition to being the inventor of the Fay automatic lathe, Mr. Fay was well known as an inventor of textile machinery, firearms, bicycles, machine parts, and automatic drilling and tapping machinery. He was born in Ludlow, Mass.; and is survived by four sons and two daughters: Arthur C. Fay, of Brooklyn, N. Y.; Major Frank H. Fay, of New York City; George L. Fay and Rimmon W. Fay, of Philadelphia; Mrs. Howard H. Wright and Miss Elsie F. Fay, of Philadelphia.

The William H. Forbes Construction Co., Cleveland, Ohio, has been chartered with a capital of $30,000 by C. A. Alexander, John H. Schultz, Quay H. Findley, K. T. Liddall and M. I. Buelow.

The National Industrial Engineering Co., Cincinnati, Ohio, announces that C. U. Carpenter, M. E., has assumed the offices of president and general manager. Richard Smethurst, C. P. A., has been appointed to the office of vice president of the company.

Personals

C. U. CARPENTER has recently been appointed vice president and general manager of the Western Appraisal Co., Cincinnati, Ohio.

CHARLES EISLER, formerly connected with the Westinghouse Lamp Co., has been made consulting engineer and vice president of the Newark Engineering and Tool Co., Newark, N. J.

G. C. COOK, general sales manager of Warner & Swasey Co., has left for a five weeks' trip through the South and to the Pacific Coast. He expects to visit about fifty cities and towns before returning.

WALTER R. DRAY, for the last two years general manager and vice president of the Hart-Parr Co., Charles City, Iowa, has resigned and will be succeeded by M. W. Ellis. Mr. Ellis was formerly president of the Security Trust and Savings Bank, Charles City, Iowa.

C. E. LAVERENZ has been appointed special railroad representative to assist the manager of western railroad sales of the Chicago Pneumatic Tool Co., Chicago, Ill. Mr. Laverenz for several years was an inspector in the Ordnance Department of the U. S. Navy and previously held a position as foreman of the Chicago and Northwestern and Illinois Central R.R.

EDW. A. WOODWORTH has been appointed special railroad representative of western railroad sales of the Chicago Pneumatic Tool Co., Chicago, Ill. Mr. Woodworth has been for several years secretary of the Committee on Standards, Washington, D. C., and previously was chief clerk to general mechanical superintendent of the Chicago, Rock Island and Pacific R.R.

Obituary

E. T. CLARAGE, president and founder of the Columbia Tool Steel Co., Chicago Heights, Ill., died suddenly at his Chicago residence early Thursday morning, Jan. 29, 1920, from pneumonia. Mr. Clarage has been well known in the steel trade for a number of years, and particularly in the tool-steel line. He was born in Kalamazoo, Mich., in 1862, and started in the tool-steel business at the age of eighteen years with the Crescent Steel Co., Chicago. Later he was sales manager for the Sanderson Steel Co. in its Chicago district. Following this, he had charge of the Crucible Steel Co.'s combined interests in the West upon the formation of that organization. In 1904, Mr. Clarage organized and built the Columbia Tool Steel Co.'s mill at Chicago Heights, Ill. He had lived in Chicago for forty years, and is survived by a widow and two children.

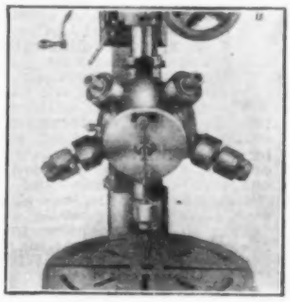
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Holder, Combined Drill and Countersink.
The Lindquist Engineering Works, Portland, Conn.
"American Machinist," Dec. 25, 1919

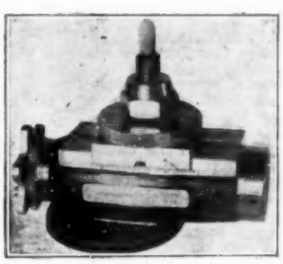
Made of a single piece of steel, hardened, and the recess accurately ground to 60 deg. to fit over a tail center. The small taper hole for receiving the combination drill and center reamer is ground at the same setting, insuring perfect alignment of the drill when placed on a lathe center. The knurled portion enables operator to hold the tool with thumb and finger while centering. The shank of the centering drill is tapered to fit the small hole on the end of the tool, and when worn out or broken may easily be replaced. The tool is made in four sizes for numbers 13, 30, 46 and 52 drills respectively.

Drill Head, Five-Spindle
The Spafford Tool Works, Hartford, Conn.
"American Machinist," Dec. 25, 1919



Spindles run at same speed as the drilling-machine spindle except No. 0, which is increased. Only spindle in use revolves, being thrown in gear as it is brought to operating station. Style No. 1 is clamped to drilling-machine sleeve. Style No. 2 is provided with taper shank to fit spindle of drilling machine. The different sizes will take drills of following diameters: No. 0, 0 to $\frac{3}{8}$ in.; No. 1, 0 to $\frac{3}{8}$ in. with chuck, or 31-64 to $\frac{7}{8}$ in. with socket; No. 2, 0 to 17-32 in. with chuck, or 37-64 to $\frac{59}{64}$ in. with socket; No. 3, $\frac{1}{16}$ to $\frac{3}{4}$ in. with chuck, or 59-64 to $1\frac{1}{4}$ in. with socket; No. 4, $\frac{3}{8}$ to 1 in. with chuck, or 1 17-64 to 2 in. with socket.

Facing and Boring Machine, Micrometer.
W. W. Ayre, 303 5th Ave., New York.
"American Machinist," Jan. 1, 1920



The cutting tool has a round shank and is held in a split chuck. The feed is by the usual star wheel and the screw is provided with a micrometer collar divided in thousandths of an inch. The main slide is graduated in inches and sixteenths and the amount the tool is off center can be seen by reference to the zero line on the tool block. The capacity for facing or boring is $6\frac{1}{2}$ in.

Grinding Machine, Reid No. 2
Reid Brothers, Inc., Beverly Mass.
"American Machinist," Jan. 1, 1920

The machine is equipped with a spring curtain and table guard. Crossfeed automatic, range, 0.007 in. to 0.084 in. Specifications: Machine will grind work 18 in. long, 6 in. wide, and $11\frac{1}{2}$ in. high. The table has three T-slots and is 46 x 8 in. in size; working surface, 18 x 6 in.; size of wheel, 7 x $\frac{1}{2}$ in. with $1\frac{1}{4}$-in. hole; countershaft, tight and loose, pulleys, 8 in. in diameter for 3-in. belt; speed, 360 r.p.m.; floor space of machine 65 x 30 in.; net weight, 1050 lb.; boxed for export, 1250 lb.; cubic feet of box, 48. Equipment furnished with machine: diamond-holder fixture, one wheel, wrenches and overhead works.

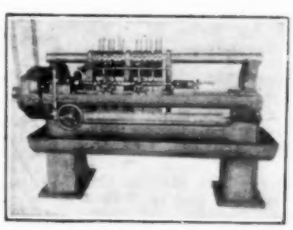
Truck, Tier Lift
Lakewood Engineering Co., Cleveland, Ohio.
"American Machinist," Jan. 1, 1920

All four wheels are used in steering and it is said that the truck can turn in a radius of 92 in. The power is by storage batteries and motors, separate motors being used for traction and lifting. Three speeds, both forward and backward, are provided and the controller handle is conveniently located for travel in either direction. The lifting mechanism is operated by means of a specially designed controller providing for one speed in either direction. Ball bearings are used throughout. The capacity is two tons with a lift of 76 in.

Grinding Machine, Reid No. 2
Fitchburg Grinding Machine Co., Fitchburg, Mass.
"American Machinist," Jan. 1, 1920

The regular equipment includes a center grinding attachment and a wheel-truing device. This machine is built in six sizes ranging from 4 x 36 in. to 12 x 54 in. The specifications of the 4 x 36-in. machine are: Capacity, 8 in. diameter, 36 in. length; table will swivel 7 deg.; work centers, No. 4 Morse taper; wheel spindle, front bearing 3 x $7\frac{3}{8}$ in., rear bearing $2\frac{1}{4}$ x $6\frac{1}{4}$ in.; grinding-wheel pulley, 6 x $4\frac{3}{8}$ in.; grinding wheel, diameter 16 in., face 1 in. to 3 in., hole 5 in.; speeds, grinding wheel (2) 1400 to 1640 r.p.m., work (6) 64 to 340 r.p.m.; table feeds (6), 28 to 150 in. per minute; tight and loose pulleys on countershaft, 700 r.p.m.; floor space, right angle to spindle 52 in., parallel to spindle 115 in.; weight, net, 4600 lb.

Lathe, Gordon Camshaft
Chas. Gordon, Inc., Milwaukee, Wis.
"American Machinist," Dec. 25, 1919



Work is supported on centers in head and tail stocks carried on auxiliary bed. Tailstock is adjustable for different lengths of shafts up to 60 in. Headstock is adjustable for turning cams when spaced unusually close. Feed is by longitudinal travel of platen which slides on end frames of main bed from left to right. Platen is driven by a screw feed and carries work across points of the cutting tools. Work is rotated by the head which is connected to an eight-splined shaft that passes through the gear box and provides constant drive for the center throughout the entire 3 in. of platen travel; this may be regulated within any suitable shorter limits by adjustable stops.

Shaping Machine, Internal Gear
Jones & Shipman, Ltd., Leicester, England.
"American Machinist," (English Edition) Jan., 1920

Intended for small internal work, but also for external gears, ratchets, etc. May be used as a bench machine or placed on a column. The work is held in a chuck which will accommodate any desired locating plate for different pieces, a quick-acting gate lock holding the job securely under the cut. The ratchet wheel is mounted on the barrel and is easily changed for different numbers of divisions. At each revolution of the chuck feed is given by ratchet gear at the top, one tooth equalling a feed of 0.0025 in. The desired depth being obtained, feed is automatically tripped and machine will run idle. Tool slide has parallel motion up to 4 in. long; can be set back or forward according to the form of the work and its position relative to the chuck slide. Tool will cut practically to a shoulder, a clearance of $\frac{1}{32}$ in. being sufficient. Capacity of the chuck is up to 5 in. in diameter; the vertical feed, $3\frac{1}{2}$ in.; teeth of 10 diametral pitch can be produced. Machine overall is 35 in. in diameter by 32 in. high, or 42 in. in diameter by $65\frac{1}{2}$ in. high if on a column.

Clip, paste on 3 x 5-in. cards and file as desired

New Publications

The Gasoline Automobile. By George W. Hobbs and Ben G. Elliott, both of the University of Wisconsin. Second edition, revised and enlarged by Ben G. Elliott and Earl L. Consoliver. 483 pp., 6 x 9, fully illustrated with photographs, diagrams and drawings. McGraw-Hill Book Co., Inc., 239 West 39th St., New York City.

The value of this well-known elementary treatise on the construction and operation of automobiles has been greatly enhanced by the addition of six new chapters to the original ten. The revision gives separate chapters to Chassis and Running Gear, Clutches and Transmissions, and Rear Axles and Differentials; while the matter contained in the chapters on Principles of Electricity and Magnetism, The Automobile Storage Battery, and Wheels, Rims and Tires is entirely new.

Written primarily for use in the extension work of the University of Wisconsin where it was very successful, it has proved to be of considerable value to the owner-driver in its first form and should be more useful in the present revised form.

Principles of Industrial Organization. By Dexter S. Kimball, professor of machine design and construction in Sibley College, Cornell University. Second edition, revised and enlarged. 325 pp., 6 x 9, illustrated with charts and diagrams. McGraw-Hill Book Co., Inc., 239 West 39th St., New York City.

In these times of industrial stress and upheaval, the eyes of most of us are fixed on the efforts to solve the problems underlying present labor troubles. Consequently, the publication of this revised edition of Professor Kimball's book is particularly timely. Both the student and the engineer will find inspiration and help in its well-written pages. The author is one of the few men who can make a dry subject read like a story which one hates to lay aside.

The chapter headings indicate the worth of the contents. They are as follows: Fundamental and Historical; The Industrial Revolution; The Effects of the Great Inventions; Modern Industrial Tendencies; Forms of Industrial Ownership; Principles of Organization—System: Planning Departments; Principles of Cost Keeping; The depreciation of Wasting Assets; Purchasing and Storing of Materials; Standards and Their Attainment; Location, Arrangement and Construction of Industrial Plants; Problems of Employment; The Compensation of Labor; Corrective Influences—Employees' Service; Résumé—Theories of Management.

Foundry Cost Accounting. By Robert E. Bett, Pelton Publishing Co., Cleveland, Ohio; 271 pages, 62 forms, tables and diagrams.

Beginning with the fundamental principles of cost accounting the author carries the reader, step by step, through the subject in a way that can be readily understood by men who have little knowledge of accounting.

Foundrymen who have no well-defined cost systems will, on studying this book, be surprised at the many small items they have neglected to charge against operating expenses. In the aggregate, these items will in many cases amount to an astonishing sum.

The subjects treated are: Importance of Accurate Knowledge of Costs; Uniform Cost Methods and the Effect on Competition; Examination of Plant Practices and Operating Conditions; Installing and Operating a Cost System; Accounting Practices and Rewards; Operating Departments and Department Records; Classification and Definition of Accounts; Monthly Statements; Product Costs; Depreciation; Estimates and Quotations; Profits.

The time taken to study this book will well repay all foundrymen irrespective of the kind and condition of their cost systems.

Mechanical Drafting Manuals. Parts I and II. By Charles B. Howe. 15 and 16 pages respectively, 8½ x 6¼ in., illustrations. John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London.

The lessons in these manuals will be found helpful to the mechanical drafting student or to anyone who wishes to take up the subject.

Part I contains fifteen lessons on the general principles of drafting and working drawings. These lessons are entitled: Representation of Objects by Lines and Views; To make a Mechanical Drawing; Principles of Lettering; Principles of Working Drawing; Relation of Views; Principles of Isometric Drawing; Application of Principles; Working Details; Isometric Drawing; Cabinet Drawing; Drawing to a Reduced Scale; Section Drawing; Assembly and Details; To Teach Inking and Tracing; To teach Blueprinting.

Part II gives sixteen lessons on geometry of drawing. They are: Geometrical Construction; Solids Parallel to Planes; Surfaces; Points and Lines; Two lessons on Solids Oblique to Planes; Auxiliary Views; The True Size of Lines and Angles, Loci; Development of Prism and Cylinders; Development of Elbow; Development of Pyramid and Cone; Two lessons on Intersection and Development of Cylinders; Intersection and Development of Cylinders and Cone; Intersection and Development of Prism and Pyramid; Development of Oblique Cone.

Trade Catalogs

Cyclometer, Die Castings, etc. The Veeder Manufacturing Co., Hartford Conn. Catalog No. 1901, pp. 52, 9 x 6 in. This catalog describes and illustrates all of the company's products; it also gives list prices.

Thread Miller. Smalley General Co., Inc., Bay City, Mich. Bulletin No. F shows a few operations of the company's thread mill machine.

Lead Burner Outfits. Davis-Bournonville Co., Jersey City, N. J. Bulletin 11 x 8½ in. This bulletin describes the Davis-Bournonville lead-burner outfits and its uses for welding leading sheets, storage-battery connections and all lead work.

Safety Bulletin. The Norton Co., Worcester, Mass. The object of this bulletin is to present in the simplest form the causes and remedies of troubles that are common among men doing shop work.

Grinding Wheels. The Norton Co., Worcester, Mass. Catalog, pp. 16, 6¼ x 3½ in. This catalog gives many suggestions for building wheel racks, reconstructing old ones and the general supervision of grinding wheels.

Safety as Applied to Grinding Wheels. The Norton Co., Worcester, Mass. Catalog, pp. 45, 8 x 5 in. A catalog of modern devices which can be applied in the use of grinding wheels and machines.

Trucking System. Howe Chain Co., Muskegon, Mich. Catalog No. 4, pp. 23, 9 x 6 in. This bulletin shows the conservation of labor in all industrial shops by the Howe trucking system.

Friction Clutches. The Edgemont Machine Co., Inc., Dayton, Ohio. Catalog, pp. 24, 6 x 9 in. This is a catalog which illustrates the different styles of friction clutches made by this concern. Numerous halftone illustrations together with line drawings and tables of dimensions and prices are given. The last two pages of this catalog gives a partial list of machine-tool builders and manufacturers and a full-page illustration showing the Edgemont factory.

Thread Gages. Arrow Tool Co., Bridgeport, Conn. Bulletin No. 3, pp. 8, 4½ x 7½ in. In this bulletin are tables of U. S. standard, A. S. M. E. and S. A. E. thread gages. These tables carry the functions of the various sizes, and also give the prices of the corresponding sizes of gages.

Electric Furnace. Ludlum Electric Furnace Corporation, Woolworth Building, New York. Catalog, pp. 19, 9 x 6 in. A brief description of this company's furnace; also a few halftones and line drawings are presented in this catalog.

Concrete Pipe. American Concrete Pipe Association, 210 South La Salle St., Chicago, Ill. This bulletin shows the broad field for concrete pipe and illustrates its adaptability for its many uses.

Electric Furnace. Modern Equipment Co., Taunton, Mass. A single-page folder illustrating and describing its electric furnace (oven type); specifications also included.

Lubricated Plug Valve. The Merrill Co., San Francisco, Cal. Catalog, pp. 15, 10½ x 6½ in. The general construction and characteristics of the Nordstrom lubricated plug valve is given in this catalog, also several illustrations and its general dimensions.

Machine Tools and Accessories. Alfred Herbert, Ltd., 54 Dey St., New York. Pamphlet, pp. 36, 8 x 10½ in. This pamphlet contains reprints of three articles that were published in the Monthly Review of "Modern Machine-Shop Practice." These articles are "Cutting Tools," which is a discussion of the design of lathe planing, shaping and slotting tools; "Standard Cutting Tools," which deals with the selection, use, manufacture, storage and maintenance; and "The Toolmaking Department," an article giving suggestions regarding the toolmaking department.

Grinding and Polishing Machines. The Fairbanks Co., Broome and Lafayette Sts., New York City. A single folder illustrating and describing its grinding and polishing machines; specifications also included.

Locomotives. The Baldwin Locomotive Works, Philadelphia, Pa. Bulletin No. 94, pp. 15, 6 x 9 in. The locomotives illustrated and described in this bulletin are all of narrow gage and represent a type which is particularly suitable for industrial, contractors and other classes of special service.

Shops. Westinghouse, Church, Kerr & Co., Inc., 37 Wall St., New York City. A four-page circular illustrating the exterior and interior views of the various machine shops that this company designed and built.

Cargo Cranes. N. B. Payne & Co., 25 Church St., New York. Bulletin No. 1, pp. 15, 11 x 9 in. This bulletin gives many lines illustrating the cargo cranes equipped with balanced hoist and transporter in loading and unloading vessels and handling freight in pier beds.

Catalogs Wanted

The Chicago Tool and Engineering Co., 343 South Dearborn St., Chicago, Ill., desires catalogs and other literature on tools, machine-shop supplies and equipment, and machine tools.

V. Lowener, 114 Liberty St., New York, will be pleased to receive catalogs and price lists for all kinds of automobile accessories and supplies for export to Scandinavia.

Fabbrica Di Automobili Lancia & Co., Torino, Italy, is interested in receiving catalogs of machines for grinding valves on the automobile engines.

Forthcoming Meetings

The American Institute of Mining and Metallurgical Engineers will hold its annual meeting in New York City, Feb. 16 to 19 inclusive.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of Eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Pa.

The Material Handling Machinery Manufacturers' Association will hold its meeting in New York City on Feb. 26 and 27.

The National Motor Boat, Ship and Engine Show will be held in New York City on Feb. 20 to 28.

The National Association of Engine and Boat Manufacturers, Inc., will hold its meeting in New York City on Feb. 26.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Pa., Howard Evans, secretary, Pier 45, North Philadelphia, Pa.

Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The Second Annual Aëronautical Exposition of the Manufacturers Aircraft Association, Inc., will be held at the Seventy-first Regiment Armory, 34th St. and Park Ave., New York, on Mar. 6-13, 1920. S. S. Bradley, 401 Fifth Ave., New York City, is the general manager.

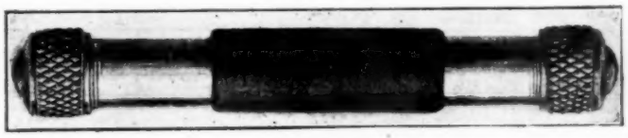
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Press, Drawing and Stamping.
Toledo Machine and Tool Co., Toledo, Ohio.
"American Machinist," Jan. 8, 1920

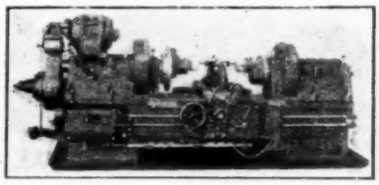
Several sizes are contained in the series, opening between the uprights from 84 to 120 in., weight from 85,000 to 240,000 lb. The specifications of the machine illustrated are: Between uprights, 84 in.; opening in bed, 28 x 76 in.; distance from bed to blank holder with stroke down and adjustment up, 52 in.; distance bed to plunger, with stroke down and adjustment up, 55 in.; adjustment of blank holder and plunger, 5 in.; stroke of blank holder, 11½ in.; stroke of plunger, 16 in.; weight of balance wheel, 1,800 lb.; speed, 250 r.p.m.; ratio of gearing, 27½ to 1; distance from floor to center of shaft, 153 in.; floor space, 110 x 195 in.; weight, 85,000 lb.

Gages, Jacques, Never Wear.
Production Equipment Co., 1 Madison Ave., New York.
"American Machinist," Jan. 8, 1920



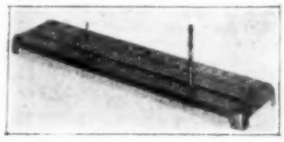
The contact points are hardened-steel balls which are retained by screw caps as shown. As wear occurs the caps can be loosened and the balls turned to present new surfaces, thus compensating for wear. Every gage is provided with rubber insulation to prevent expansion from the heat of the hand. The gages are made in sizes from 1 to 12 in., varying by inches, though any intermediate sizes can be furnished. It is claimed that the gages are accurate, though the degree of accuracy is not stated.

Lathe, Wickes, Crankshaft.
Wickes Brothers, Saginaw, Mich.
"American Machinist," Jan. 8, 1920



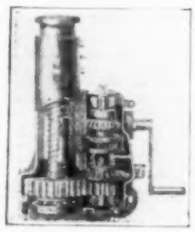
Machine is built in two standard types, Duplex and Universal. Duplex will turn two pins simultaneously; Universal, one pin. Two speeds obtained through sliding gears, 75 to 100 r.p.m. The drive pulley runs at 400 r.p.m.; is 20 in. in diameter, and has a 6½ in. face. It is equipped with Hyatt roller bearings. Both the duplex and universal machines are usually motor driven through a short belt provided with a tightener. Motor is 15 hp. with a speed of 1200 r.p.m. The machine is furnished with or without a feed box as may be desired, and, when so equipped, has 36 feeds. The weight is 12,000 lb.

Gage and Drill Holder, "Quickbak."
Russel & Burr, 716 Land Title Building, Philadelphia, Pa.
"American Machinist," Jan. 15, 1920



Guide lines run from the V-slot to the holes, and when placing a drill in the holder it is simply a matter of gaging the drill and then following the corresponding line to the correct hole. When selecting a drill for use the gage will often be found useful in addition to the fact that every hole has the size number stamped beside it. Another feature of the gage is that on the opposite side of the slot from the guide lines it is graduated in thousandths and can be accordingly used independently to determine exact sizes.

Jack, High Speed Ball Bearing.
Duff Manufacturing Co., Pittsburgh, Pa.
"American Machinist," Jan. 8, 1920



The load is raised by means of a 6-ft. lever which operates a double-threaded screw through a ratchet and gearing. The screw has a steep pitch, turns in a bronze nut, and the thrust is taken by a ball bearing. For lowering the load, a crank handle is used. Safety in operation is assured by a positive clutch which holds the load at all times and that, regardless of the speed used in lowering, the load may be stopped at any desired point. The line comprises three sizes of jacks with heights of 20, 24 and 26 in. and capable of maximum raises of 6, 10 and 12 in. respectively. Each has a lifting capacity of 75 tons.

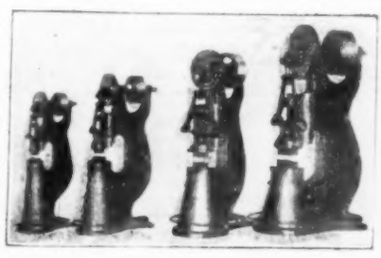
Dresser, Radius and Angle Grinding Wheel.
S. L. & M. Sales Co., 408 Moffat Building, Detroit, Mich.
"American Machinist," Jan. 8, 1920

A tool for dressing abrasive wheels with radius or angular faces as shown in the accompanying illustration. It is claimed that this tool will dress a 12-in. wheel to a radius of from 0 to 1½ in. either convex or concave, and also to any desired angle. The toolpost has a height adjustment of 2 in.

Drills, Radial.
F. Pollard & Co., Ltd., Leicester, England.
"American Machinist," (English Edition) Dec. 20, 1919.

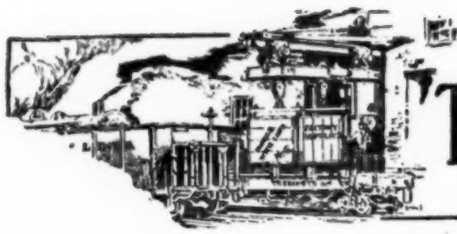
Made in two sizes, 36 in. and 48 in.; drive through two-speed countershaft and cone pulleys. All the machines have a vertical adjustment of spindle of 6 in.; of spindle bracket, 8 in.; of table, 12 in.; maximum distance spindle to table, 26 in.; from face of the column to the center of the spindle, 31½ in. and 43½ in. Working surface of the table may be 34 x 26 in. or 46 x 26 in. For the gear-box machine the driving pulley is 8 in. in diameter by 2⅝ in. wide. The spindle is 1 in. in diameter in the rack bush, No. 3 Morse taper. Dimensions apply also to the machines with cone-pulley drive, except that the driving pulleys are 8 in. and 10 in. by 2½ in. With a single-pulley drive capacity of each machine includes drilling holes up to 1¼ in. in diameter and tapping up to ¾ in. Whitworth; machine with cone-pulley drive and ball bearings, same capacity. If machine has plain bearings it will drill up to ⅞ in., tapping up to ½ in. Whitworth. In each case the total height is 8 ft.

Hammer, Mayer Power.
Kaukauna Machine Works, Kaukauna, Wis.
"American Machinist," Jan. 15, 1920



The hammers are built in five sizes, having a respective capacity of 25, 50, 100, 250 and 500 lb. They will forge round stock from 2 in. to 8 in. and square stock from 1¼ in. to 7 in. Flat stock from 2½ in. to 8 in. wide can be handled edgewise. Power required, 1 to 7½ hp. Weight without motor, 750, 1,500, 3,000, 5,800 and 10,000 lb.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	Current	One Month Ago
No. 2 Southern	$43.60	$36.60
Northern Basic	39.80	34.00
Southern Ohio No. 2	42.80	36.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	47.65	39.40
Southern No. 2 (Silicon 2.25 to 2.75)	47.70	41.40
BIRMINGHAM		
No. 2 Foundry	40.00	33.00
PHILADELPHIA		
Eastern Pennsylvania No. 2	44.00*	38.10*
Virginia No. 2	42.00*	39.10*
Basic	41.50†	34.60†
Grey Forge	41.50*	34.60*
CHICAGO		
No. 2 Foundry local	42.25	36.25
No. 2 Foundry, Southern	45.00	38.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	42.40	.....
Basic	41.90	34.40
Bessemer	43.40	35.40
MONTREAL		
Silicon 2.25 to 2.75%	40.00	.....

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$3.47	$4.07	$3.27–2.32	$3.97	$3.47	$4.07
Soft steel bars	3.52	3.52	3.97	3.52	4.07	3.52	3.97
Soft steel bar shapes	3.52	3.52	3.97	3.57–3.82	4.07	3.52	3.97
Soft steel bands	4.22	4.22	4.57	5.25	.....	.....	.....
Plates, ¼ to 1 in. thick	3.67	3.67	4.27	4.50	4.47	3.67	4.27

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$3.50	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	3.90
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Mill Carloads, Pittsburgh	New York		Cleveland	Chicago
		Current	One Year Ago		
No. 28 black	$4.35–4.85	$7.00–8.00	$6.22	$6.15	$6.50
No. 26 black	4.25–4.75	6.90–7.90	6.12	6.05	6.40
Nos. 22-24 black	4.20–4.70	6.85–7.35	6.07	6.00	6.35
Nos. 18-20 black	4.15–4.65	6.80–7.30	6.02	5.95	6.30
No. 16 blue annealed	3.75–4.20	5.77	5.37	5.55	5.47
No. 14 blue annealed	3.65–4.10	5.67	5.27	5.45	5.37
No. 10 blue annealed	3.55–4.00	5.32–7.00	5.17	5.35	5.27
No. 28 galvanized	5.70–6.20	8.00–9.00	7.57	7.50	8.00
No. 26 galvanized	5.40–5.90	7.70	7.27	7.40	7.70
No. 24 galvanized	5.25–5.75	7.55	7.12	6.95	7.55

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.50	$5.40	$5.50
Flats, square and hexagons, per 100 lb. base	6.00	5.90	.....

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$25.50–30.00
Cleveland	20.00	20.00
Chicago	16.50	16.50

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
1/16, 11, 5/64, 3, 7/64, 1/8, No. 8, 9/32 and No. 10	21.00 to 30.00	1/8 by 12 in. long	14.00
5/32		1/8 by 19 in. long	12.00
No. 12		3/16 by 19 in. long	10.00
7/32, No. 14 and 1/4		1/4 by 21 in. long	10.00
No. 18		Special Welding Wire, Coated	
No. 20		1/16	33.00
Domestic 20c. for 1/16, 15c. for 1/8 to 7/32		5/32	30.00
		1/4	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	11.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	5.50	4.32
Cold-rolled strip steel	10.00	8.25	8.00
Floor plates	6.55	6.00	6.27

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M[illegible]r's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
1/8, 1/4 and 3/8	50%	24%	1/8 to 1 1/4	30%	23 1/2%
1/2	54%	40%			
3/4 to 3	57 1/2%	44%			

LAP WELD

2	50%	35%	2	32 1/2%	18 1/2%
2 1/2 to 6	53 1/2%	41%	2 1/2 to 6	34 1/2%	21 1/2%

BUTT WELD, EXTRA STRONG PLAIN ENDS

1/8, 1/4 and 3/8	46 1/2%	29%	1/2 to 1/4	39 1/2%	24 1/2%
1/2	51 1/2%	39%			
3/4 to 1 1/4	55 1/2%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48 1/2%	37%	2	33 1/2%	20 1/2%
2 1/2 to 4	51 1/2%	40%	2 1/2 to 4	.....	23 1/2%
4 1/2 to 6	50 1/2%	39%	4 1/2 to 6	34 1/2%	22 1/2%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1/8 to 3 in. steel butt welded	40%	24%	40%	31%	57 1/2%	44%
2 1/2 to 6 in. steel lap welded	35%	20%	42%	27%	53 1/2%	41%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 22 1/2%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.25	19.00	20.00
Tin in 5-ton lots	60.00	59.00	71.50
Lead	9.00	7.875	5.30
Spelter	9.50	9.25	7.10
ST. LOUIS			
Lead	8.37 1/2	6.55	5.00
Spelter	9.22 1/2	7.95	6.75

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

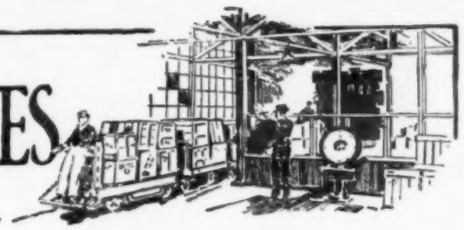
	New York			Cleveland		Chicago	
	Current	Month Ago	Year Ago	Current	Year Ago	Current	Year Ago
Copper sheets, base	29.50	28.50	29.00	31@32	31.00	36.00	32.00
Copper wire (carload lots)	29.25	28.00	28.00	29.50	32.00	27.00	28.50
Brass sheets	26.50	25.50	29.00	29.00	32.00	27.00	29.00
Brass pipe	32.00	30.50	37.00	34.00	38.00	35.00	37.00
Solder (half and half) (case lots)	39.00	35.00	41.00	40.50	44.00	38.00	39.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	26.00
New York	23.75	27.40
Cleveland	29.00	30.00
Chicago	26.00	28.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill..... 12.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	18.75	15.50	18.40
New York	14.00	16.00	14.50	16.50
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	11.25	8.00
Chicago	12.00	8.50
Cleveland	11.75	10.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy, and crucible	17.00–17.50	16.00	18.00	17.00	17.50
Copper, heavy, and wire	16.50 17.00	15.00	17.50	16.00	17.00
Copper, light, and bottoms	15.50 16.00	12.50	16.00	13.00	15.75
Lead, heavy	6.75– 7.00	4.00	7.50	4.00	7.25
Lead, tea	6.00– 6.25	3.00	5.00	3.00	6.00
Brass, heavy	12.00–12.50	9.50	14.00	12.00	17.00
Brass, light	9.50–10.00	7.50	10.50	8.00	10.50
No. 1 yellow brass turnings	10.00–10.50	10.00	11.00	8.00	11.00
Zinc	6.00– 6.25	5.00	5.00	4.00	7.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	31.50—32.50	34.00c.@35.00c.	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	33.00	28.00
Chicago	29.00	38.00
Cleveland	32.00	33.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	87.00	74.50	80.00	70.00	75.00
Commercial	50.00	42.00	20.50	21.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square. List	.80	$1.00	$1.25	$1.25	.98	
Hot pressed hexagon List	.80	1.00	1.05	1.25	.78	
Cold punched hexagon List	2.50	1.00	.75	.90	1.00	
Cold punched square List	2.50	1.00	.75	.90	1.00	

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	70–5%	50–10%
Chicago	50%	50%
Cleveland	60–10%	50–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	50%	35–5%
Larger and longer up to 1½ in. by 30 in.	20%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $1.50 Cleveland..... $4.50 Chicago..... $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	25%	40–5%	30%
Larger and longer up to 1 in. by 30 in.	15%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	List	30%	List
Chicago	10%	List	10%	List plus 20%
New York	10%	20% from list	10%	List plus 5%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅜ and smaller	40%	55% off	45%
Tinned	40%	55% off	45%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.00 Cleveland...$4.00 Chicago....$4.97 Pittsburgh...$4.72

Structural, same sizes:

New York...$5.10 Cleveland...$4.10 Chicago....$5.07 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb. advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb. 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	16.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.75
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.25	4.625	4.25
Chicago	5.00	4.125	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Febr. 5	Jan. 29	Jan. 22	Jan. 15
Prompt furnace	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.49	$1.98	$1.66
5-gal. cans	2.00	1.74	2.23	1.86

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	15.00	16.50	13.00	14.50	15.00	13.00
25 and 50-lb. kegs	15.25	16.75	13.25	14.75	15.25	13.25
12½-lb. keg	15.50	17.00	13.50	15.00	15.50	13.50
5-lb. cans	....	18.50	.....	.....	17.00	15.00
1-lb. cans	....	19.50	.....	.....	18.00	16.00

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

NEW AND ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools.

Conn., Hartford—J. L. Purcell, Chemical Bldg., Comr., Municipal Bldg.—automobile repair shop equipment.

Me., Farmington Falls—The Dingley Thomas Co.—machinery to be used in canning factory.

Me., Lewiston—The Androscoggin Electric Co.—punch machine for electrical fixture work.

Me., Portland—A. S. Hindo, 20 West St.—tanks, kettles, retorts and all laboratory equipment.

Mass., Boston—The Simbroco Co., 161 Devonshire St.—concrete block machinery.

R. I., Newport—J. J. Moore, Naval Torpedo Station—horizontal boring machine with vertical attachment.

N. Y., New York (Borough of Bronx)—A. Sturtevant, 881 East 178th St.—a 16 in. shaper, a milling and filing machine.

N. Y., New York (Borough of Brooklyn)—M. Riley, 427 Baltic St., will build a 1 story, 75 x 100 ft. garage, on Baltic and Bond Sts. Estimated cost, $30,000.

N. Y., New York (Borough of Manhattan)—The Champion Eng. Co., 21 Park Row—one 12 to 16 ft. boring mill and one 4 ft. lathe, to have 15 ton capacity.

N. Y., New York (Borough of Manhattan)—W. A. Farrel Co., 89 Water St.—50 in. lathe, to have 18 ft. centers.

N. Y., New York (Borough of Manhattan)—M. Greenstein, 206 West 29th St.—woodworking machinery.

N. Y., New York (Borough of Manhattan)—The Keystone Eng. and Equipment Corp., 50 Church St.—5 ft. universal radial drill (new).

N. Y., New York (Borough of Manhattan)—The Yale Piston Ring Co., 560 West 36th St.—machinery for the manufacture of piston rings.

Penn., Chester—W. F. Gray, 502 West 7th St.—garage equipment.

Pa., Coatesville—Breuinger Bros.—machinery for the manufacture of ice cream.

Pa., Philadelphia—J. Josepson, 3415 Germantown Ave.—machinery for the manufacture of wooden spools.

Pa., Philadelphia—The Philadelphia & Reading R.R., 11th and Market Sts.—air compressors, ditchers, wrecking crane and radiator valves.

Pa., Philadelphia—J. Shapiro, 2011 Market St.—machinery for the manufacture of paper boxes.

Pa., Philadelphia—The Standard Crown Co., Hope and Palmer Sts., manufacturer of bottles and stoppers—machinery for the manufacture of bottle seals.

Pa., Pittsburgh—The Gearless Motor Corp., 115 Plavel St.—18 to 20 in. hollow spindle screw cutting machine, 16 in. x 6 ft. high speed heavy duty screw cutting lathe, hand screw machines, turret lathe with 16 in. power feeds, Fox type brass finishing lathe, grinders and miscellaneous equipment.

Pa., Pittsburgh—The Pennsylvania R.R., Lines West of Pittsburgh, Union Sta., Pittsburgh—two 200 ton vertical hydraulic double deck forcing presses, 24 in. between columns, one for Mingo Junction, Ohio, shops, and one for Wellsville, Ohio, shops; also 1 steam hydraulic forcing press for Ft. Wayne, Ind., shops.

Pa., Pittsburgh—The Pittsburgh Conveying Machinery Co., Duquesne Way and 4th St.—5 ft. radial drill, 12 x 24 in. screw cutting lathe, heavy drill press to take up to 3 in. drills, medium shaper for plate mill work.

Pa., Pittsburgh—E. L. Suess, 460 Melwood Ave.—14 or 16 in. tool room lathe, 18 or 20 in. engine lathe, 20 or 24 in. drill press with pump, 16 in. shaper, several screw machines, Universal miller, Universal grinder (used).

Ga., Atlanta — The Southern Metal Trades Association, Candler Bldg.—5 or 6 ft. radial drill, 18 or 24 in. shaper, 21 or 24 in., 5 to 6 ft. bed lathe, bolt threading machine to take up to 2 in. (new or used).

Ind., Anderson—The Anderson Rubber Co., 1400 Meridian St.—radial drill (used).

Ind., Ft. Wayne—The Eng. Co., Winter and Wabash Sts.—power press for making 14 or 16 gauge steel trays up to 16 x 21 in., with straight flanged sides, 3 in. deep.

Mich., Gladstone—The Marvle Card Electric Co.—30 to 36 in. vertical boring mill with turret head for boring side heads, equipped with motor drive but without motor.

Mich., Port Huron—A. B. Parfet, Military St.—machine shop equipment.

Mich., Redford — The Michigan State Automobile School, Woodward Ave., Detroit—complete equipment for technical and shop training.

O., Cleveland—D. Moore, 7122 Euclid Ave.—Universal wood working machine.

O., Cleveland—The Motor Products and Engineering Co., East 61st St.—crank shaft grinder.

O., Westerville (Columbus P. O.)—The Hance Mfg. Co.—machinery for the manufacture of vending machines.

Wis., Sheboygan — The Globe Metal Products Co., 824 Pennsylvania Ave.—an 8,000 lb. and a 4,000 lb. electric traveling crane.

Ia., Des Moines—The J. J. Doty Publishing Co.—motors and printing machinery.

Mo., Kansas City—The Triumph Truck and Tractor Co., Ridge Arcade—lathes.

Tex., Houston — The Hanak Conveyor Mfg. Co., McKinney and Sampson Sts.—2 lathes and 1 milling machine.

Cal., Los Angeles—A. Ransom, 838 South Grand Ave.—10 x 24 or 10 x 36 plain grinder, power feed, several single and multiple spindle drills for bench and floor and a Whitney hand miller (new or used).

Cal., Turlock—The G. W. Hume Co.—fruit packing and canning machinery. Estimated cost, $35,000.

Ore., Klamath Falls—The Ewauna Box Co.—9 ft. band saw.

Wash., Seattle—The Gladstone Co., Hoge Bldg.—machinery for the manufacture of automatic drinking fountains.

Ont., Toronto—W. D. Beath & Son, 20 Cooper Ave.—squaring shear to cut up to 10 or 12 gauge.

Metal Working

NEW ENGLAND STATES

Conn., Hartford—The city plans to build a machine and repair shop, also an office building. Estimated cost, $60,000. Address J. L. Purcell, Municipal Bldg.

Me., Portland—The Amereican Can Co., 120 Broadway, New York City, has awarded the contract for the construction of a factory, here.

Me., Portland—A. S. Hindo, 20 West St., has awarded the contract for the construction of a 90 x 150 ft. laboratory. Estimated cost, $150,000.

Mass., Boston—The Simbroco Co., 161 Devonshire St., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory, at 270 Baker St., for the manufacture of concrete products. Estimated cost, $70,000.

Mass., Charleston — The Commercial Brewery Co., Rollins St., plans to build a 1 and 2 story, 50 x 110 ft. garage, on Cambridge St. Estimated cost, $75,000. P. J. Griffin, engr.

MIDDLE ATLANTIC STATES

Md., Baltimore—Dean's Garage Co., 554 Equitable Bldg., will soon award the contract for the construction of a 1 story, 189 x 222 ft. garage, on Reisterstown Rd. near Gordon St. Estimated cost, $45,000. F. E. Beall, 1335 North Gilmor St., Archt.

Md., Baltimore—The C. D. Pruden Co., Warren and Dock Sts., manufacturer of portable steel buildings, sheet metal window frames, sash, etc., will build a 1 story addition to its plant. Estimated cost, $150,000.

N. J., Boonton—The Yale Piston Ring Co., 560 West 36th St., New York City, is building a 60 x 100 ft. addition to its plant, here.

N. J., Jersey City—W. M. Crane Co., Garfield Ave., manufacturer of stoves, has awarded the contract for the construction of a plant, to include 2 or 3 foundry buildings. Estimated cost, between $200,000 and $300,000.

N. J., Newark—The General Lead Batteries Co., 123 West 56th St., New York City, is having plans prepared by Timmis & Chapman, Engrs., 315 5th Ave., New York City, for the construction of a 5 story factory, on Lester Ave. and Chapel St., here. Estimated cost, $150,000.

N. J., Newark—Norton, Bird & Whitman, 501 5th Ave., New York City, will build a 3 story, 35 x 45 ft. and 85 x 130 ft. garage.

N. Y., New York (Borough of Bronx)—W. L. Byrnes, c/o E. Wilbur, Archt., 507 5th Ave., New York City, will build a 3 story, 50 x 100 ft. garage. Estimated cost, $35,000.

N. Y., New York—(Borough of Brooklyn)—Modua & Catalbiano, 268 Jefferson Ave., will build a 1 story, 100 x 100 ft. garage, on De Kalb and Irving Aves. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—L. Oxfeld, 3563 Stone Ave., will build a 1 story, 75 x 100 ft. garage, on Ormond Pl. and Putnam Ave. Estimated cost, $30,000.

N. Y., New York (Borough of Brooklyn)—D. Perlman, 13 Pennsylvania Ave., will build a 1 story, 125 x 125 ft. garage and showroom, on Crower St. and Bedford Ave. Estimated cost, $40,000.

N. Y., New York (Borough of Brooklyn)—Tannenbaum & Eisenberg, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 99 x 106 ft. garage, on Atlantic and Schenectady Aves. Estimated cost, $20,000.

N. Y., New York (Borough of Manhattan)—The T. Klein Constr. Co., 652 West 185th St., New York City, will build a 1 story, 199 x 385 ft. garage, on 5th and Madison Aves. and 136th and 137th Sts. Estimated cost, $150,000.

N. Y., New York (Borough of Manhattan)—The Le Bash Garage Co., 30 East 42nd St., will build a 1 story, 100 x 185 ft. garage, on Whitlock Ave. and 156th St. Estimated cost, $30,000. J. Bashim, Pres.

N. Y., New York (Borough of Queens)—L. Gold, 44 Court St., Brooklyn, will build a 2 story, 75 x 180 ft. service station, on Henry and William Sts., here. Estimated cost, $75,000.

N. Y., Rye—W. E. Peet, Grace Church St., is having plans prepared by Ewing & Allen, Archts., 101 Park Ave., New York City, for the construction of a 1 story garage. Estimated cost, $25,000.

Pa., Avonmore—The Fahnestock Mfg. Co. is building a 130 x 140 ft. addition to its plant, for the manufacture of steel castings. Estimated cost, $25,000.

Pa., Chester—W. F. Gray, 502 West 7th St., has awarded the contract for the construction of a 2 story, 50 x 117 ft. garage, on 7th and Parker Sts. Estimated cost, $20,000.

Pa., Erie—The Hays Mfg. Co., 12th and Liberty Sts., is having plans prepared by E. McGeorge, Archt. and Engr., 1900 Euclid Ave., Cleveland, Ohio, for the construction of a 2 story forge shop. Estimated cost, $75,000.

Pa., Philadelphia—The Jarden Lithographing Co., 310 North 11th St., will soon award the contract for the construction of a 2 story, 38 x 53 ft. factory, on 10th and Pearl Sts. Estimated cost, $20,000. Franklin & Co., Crozier Bldg., Archts.

SOUTHERN STATES

La., Monroe—N. C. McGowan, Shreveport, has leased a site in the Monroe gas field district about 17 miles from here, and plans to build a carbon black plant. Estimated cost, $250,000.

S. C., Columbia—The Red Arrow Service Station, Washington and Sumter Sts., will build a 50 x 65 ft. garage and service station. Estimated cost, $15,000.

MIDDLE WEST

Ill., Chicago—Lindstrom, Smith & Co., 1104 South Wabash Ave., manufacturer of electrical specialties, has awarded the contract for the construction of a 1 story, 130 x 250 ft. factory, on Lake St. and Kedzie Ave. Estimated cost, $125,000. E. C. & R. M. Shankland and R. E. Pingree, 209 South La Salle St., Archts.

Ill., Chicago — The Monighan Machine Co., 2036 West Carrol Ave., is having plans prepared by A. P. Weber, Archt., 111 West Washington St., for the construction of a 110 x 504 ft. factory, on Augusta, Kilpatrick and Belleplaine Aves. Estimated cost, $250,000.

Ill., Chicago—G. M. Posner & Co., 327 South La Salle St., will soon award the contract for the construction of a 1 story, 125 x 125 ft. machine shop, on Wolfram St. and Western Ave. Estimated cost, $50,000. B. L. Steif, 30 North La Salle St., Archt.

Ill., Chicago—The Premier Lithographing Co., c/o L. C. Bouchard, Archt., 64 West Randolph St., has awarded the contract for the construction of a 4 story, 60 x 70 ft. printing plant, at 1855 North Halsted St. Estimated cost, $80,000.

Ind., Marion—The Western Drop Forge Co. has awarded the contract for the construction of a 1 story factory. Estimated cost, $80,000.

Mich., Port Huron — A. B. Parfet, Military St., plans to build a 2 story, 100 x 250 ft. service station. Estimated cost, $100,000.

Mich., Redford—The Michigan State Automobile School, Woodward Ave., Detroit, will soon award the contract for the construction of a technical school, to include a 1 story, 100 x 200 ft. tractor building, a 1 story, 40 x 300 ft. motor building and a 2 story, 90 x 300 ft. garage, on Grand River Ave., here. Estimated cost, $2,000,000. C. W. Brandt, Kresge Bldg., Detroit, Archt.

O., Cincinnati—The Jarecki Chemical Co., Broerman Ave., has awarded the contract for the construction of a 1 story, 120 x 350 ft. factory. Estimated cost, $300,000

O., Cincinnati—The Sayers & Scovill Co., Gest and Summers St., has awarded the contract for the construction of a 3 story, 80 x 380 ft. factory on Spring Grove Ave., for the manufacture of automobiles. Estimated cost, $400,000.

O., Cleveland—The Cleveland Worm and Gear Co., 1669 East 40th St., has awarded the contract for the construction of a 1 story, 130 x 160 ft. factory, on East 41st St. and Payne Ave. Estimated cost, $75,000.

O., Cleveland — The Complete Roofing Co., 4711 Payne Ave., will soon award the contract for the construction of a 1 story, 50 x 80 ft. factory and warehouse. Estimated cost, $50,000. M. Greenberg, Pres.

O., Cleveland—The East End Chamber of Commerce, 10708 Superior Ave., is having plans prepared by T. G. Perren, Archt., 912 Marshall Bldg., for the construction of an 8 story, 80 x 120 ft. commercial building, on East 105th St. and Superior Ave. Address S. H. Kennard. Estimated cost, $400,000.

O., Columbus—The Cole Motor Sales Co., 781 North High St., is having plans prepared by C. L. Inscho, Archt., Brunson Bldg., for the construction of a 2 story, 47 x 252 ft. garage and salesroom, on East Broad St. Estimated cost, $120,000.

O., Columbus — The German American Publishing Co., 201 Hartman Bldg., will soon award the contract for the construction of a 6 story, 50 x 62½ ft. printing plant, on East Main St. Estimated cost, $55,000. J. Goldsmith, Wheeler Bldg., Archt.

O., Dayton—The Edwards Garage Co., Main and Brown Sts., has awarded the contract for the construction of an addition to its garage. Estimated cost, $20,000.

O., Lima—The Union Tank Line Co. has purchased a 130 acre site, adjoining the property of the Solar Refinery, and plans to build a factory, to have a yearly capacity of 25,000 tank cars. Estimated cost, $20,000,000.

Wis., Menomonee Falls—The Schumann Motor Co., will soon award the contract for the construction of a 1 story, 75 x 150 ft. garage and repair shop. Estimated cost, $50,000. Herbst & Kuenzli, Caswell Bldg., Milwaukee, Archt.

Wis., Milwaukee—J. Ruesch, 485 Broadway, will soon award the contract for the construction of a 3 story, 30 x 120 ft. repair shop. Estimated cost, $40,000.

Wis., Milwaukee—The Standard Oil Co., Brumder Bldg., will soon award the contract for the construction of a 4 story, 75 x 150 ft. office and service station, on 4th St. Estimated cost, $350,000. A. D. Koch, Wells Bldg., Archt.

Wis., St. Francis (Milwaukee P. O.)—The Nash Motors Co., Kenosha, has awarded the contract for the construction of a 1 story, 150 x 600 ft. assembling plant. Estimated cost, $150,000.

Wis., Sheboygan Falls — The White Wagon Wks. plans to build a 4 story, 60 x 250 ft. addition to its plant, on Main St. Estimated cost, $40,000.

WEST OF THE MISSISSIPPI

Ida., Reubens—The Reubens Garage Co. plans to build a 1 story, 50 x 120 ft. garage. Estimated cost, $50,000.

Ia., Des Moines—The J. J. Doty Publishing Co. has awarded the contract for the construction of a 3 story, 65 x 130 ft. publishing house, on 3rd and Chestnut Sts. Estimated coscet, $65,000.

Ia., Sioux City—The Sioux City Soap Co., 302 Grain Exhange Bldg., plans to build a soap fatory.

Kan., Hutchinson—A. E. Kirk is having plans prepared by W. E. Glover, Archt., 609 Kansas Ave., Topeka, for the construction of a 3 story, 165 x 166 ft. garage. Estimated cost, $250,000.

Kan., Hutchinson—The McArthur Packing Co. plans to build a packing plant. Estimated cost, $100,000.

Kan., Topeka—The Page Milling Co., North Topeka, is having plans prepared by C. D. Cuthbert, Archt., 235 Kansas Ave., for the construction of a 3 story, 50 x 150 ft. garage at 912 Kansas Ave. Estimated cost, $55,000.

Mo., St. Louis—The Bayer Steam Soot Blower Co., 2828 La Salle St., has awarded the contract for the construction of a 1 story, 60 x 160 ft. foundry, at 4065 Park Ave. Estimated cost, $22,000. G. P. Wuest, Wainwright Bldg., Archt.

Tex., Beaumont—The Ford Agency, c/o B. M. Barker, Austin, will soon award the contract for the construction of a 2 story, 120 x 140 ft. garage and warehouse, at Franklin and Pearl Sts. Estimated cost, $80,000. H. F. Kuehne, Littlefield Bldg., Austin, Archt.

Tex., Dallas—The United Motor Service has awarded the contract for the construction of a 4 story factory. Estimated cost, $200,000.

Tex., Houston — The Lucey Mfg. Co., Mason Bldg., manufacturer of gas and oil well supplies, plans to build a forge shop, machine shop and foundry. Estimated cost, $1,000,000. Noted Feb. 20.

Tex., Houston—The Texas Union Packing Co., 210 Beatty Bldg., is having plans prepared by W. H. Knehaus, Archt., 412 South Dearborn St., Chicago, Ill., for the construction of a plant, to consist of several buildings. Estimated cost, $1,000,000.

WESTERN STATES

Cal., Anaheim—Bd. Educ. is having plans prepared by J. F. Walker, Archt., 1st Natl. Bank Bldg., for the construction of an auditorium, gymnasium and domestic science department. Estimated cost, $150,000.

Cal., Los Angeles—T. Cohen & Meyer, c/o G. La Barr, Archt., 500 Stinson Bldg., are having plans prepared for the construction of a 1 story, 77 x 172 ft. garage, on Grand Ave. Estimated cost, $55,000.

Cal., Los Angeles—The Pacific Mutual Life Insurance Co., 6th and Olive Sts., has awarded the contract for the construction of a 2 story, 33 x 60 ft. underground garage, on Grand Ave. to Olive St. north of 6th St. Estimated cost, $125,000.

Cal., San Diego—Bids will be received at the office of the Public Works Officer, Timken Bldg., until 11 a.m., and at the Bureau of Yards and Docks, Navy Dept., Washington, D. C., until 2 p.m., for the construction of a fuel oil storage plant at the Marine Corps Base, specification No. 4102.

Cal., Stockton—The California Tractors, Inc., recently organized with $500,000 capital stock, has purchased a site here, and plans to build a tractor factory. Address P. Rossier, Bank of Italy Bldg., San Francisco.

Cal., Turlock—The Stanislaws Co. Fig Growers Association and the Braden Preserving Co., 449 South Raymond Ave., Pasadena, are having plans prepared for the construction of a 60 x 125 ft. packing plant, here. Estimated cost, $100,000.

Ore., Bend—L. L. Fox plans to build a 1 story, 100 x 140 ft. garage. Estimated cost, $50,000.

Ore., Bend—W. H. Manwaring, Marshfield, has leased a site on Greenwood Ave., here, and plans to build a 1 story, 70 x 125 ft. automobile service station. Estimated cost, $50,000. W. R. Speck, local representative.

Wash., Seattle—The Gladstone Co., Hoge Bldg., plans to build a 2 story, 65 x 120 ft. factory, at 2200 Western Ave., for the manufacture of automatic drinking fountains. Estimated cost, $50,000.

CANADA

Ont., Brantford—The Dominion Steel Products Co., Ltd., is building a 100 x 160 ft. foundry, to be equipped with 2 cupolas, to have an annual capacity of 15,000 tons castings.

Ont., Windsor — The Wood Hydraulic Hoist and Body Co., 1028 Bellevue Ave., Detroit, Mich., has purchased a site on Howard Ave. and Tecumseh Rd., here, and plans to build a factory for the manufacture of hydraulic hoists and bodies for motor trucks.

General Manufacturing

NEW ENGLAND STATES

Me., Farmington Falls—The Dingley Thomas Co. has awarded the contract for the construction of a 2 story, 100 x 200 ft. canning factory. Estimated cost, $35,000.

Me., Thorndike—The Laco Valley Canning Co. plans to build a 2 story, 100 x 250 ft. canning factory. Estimated cost, $20,000.

Mass., Holyoke—The W. Skinner Sons Co., Appleton St., has awarded the contract for the construction of a 5 story, 90 x 200 ft. factory, for the manufacture of silk linings. Estimated cost, $225,000.

Mass., Somerville (Boston P. O.)—The Prospect Hill Bottling Co., 153 Cross St., has awarded the contract for the construction of a 2 story, 59 x 199 ft. bottling plant. Estimated cost, $100,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Falconer Co., Gay and Water Sts., will soon award the contract for the construction of an 8 story, 45 x 150 ft. addition to its printing plant. Estimated cost, $100,000. H. Massart, 328 West Charles St., structural engr. C. L. Reeder, Park Ave. and Saratoga St., consult. engr. Smith & May, 1133 Calvert Bldg., Archt.

Md., Baltimore—The International Bedding Co., Guilford Ave. and Chase St., is having plans prepared by J. Freund, Archt., 1307 St. Paul St., for the construction of a 6 story, 86 x 110 ft. bedding factory. Estimated cost, $175,000. H. M. Taylor, Mgr.

Md., Baltimore—A. H. Kuhlemann Co., 2961 Frederick Ave., has awarded the contract for the construction of a 3 story, 75 x 200 ft. factory, for the manufacture of oleomargarine. Estimated cost, $100,000.

Md., Baltimore — Levenson & Zenitz, Howard and Ostend Sts., manufacturer of furniture, will soon award the contract for the construction of a 1 story factory. Estimated cost, $20,000.

N. J., Clifton—The Clifton Textile Co., 128 Hackensack Plank Rd., will build six, 1, 2 and 3 story, 250 x 350 ft. factory buildings. Estimated cost, $600,000.

N. J., New Brunswick — The Trenton Porcelain Co., 803 East State St., Trenton, will soon award the contract for the construction of a 2 story, 32 x 100 ft. porcelain plant, here. Estimated cost, $20,000. W. A. Kleman, 1st Natl. Bank Bldg., Archt. G. E. Maguire, Pres.

N. Y., Bridgeport—The Salts Textile Co. will soon award the contract for the construction of a 1 story, 105 x 340 ft. factory. Ballinger & Perrot, 17th and Arch Sts., Philadelphia, Archts.

N. Y., Buffalo—The Dunlop Tire Corp. of England plans to build a large tire plant, on the River Rd., here. Estimated cost, $10,000,000. Address Chamber of Commerce, Buffalo.

N. Y., Genesee—The Rochester Railway and Light Co., 34 Clinton St., N., Rochester, plans to rebuild the Big Tree Flour and Grain Mill, here, which was recently destroyed by fire.

N. Y., New York (Borough of Brooklyn)—The Brooklyn Retail Butchers Corp., 3285 Fulton St., plans to build a 3 story, 130 x 135 ft. ice plant and storage house, on Atlantic Ave. and Ft. Greene Pl. Estimated cost, $400,000. A. Rosen, Pres.

N. Y., New York (Borough of Brooklyn)—The Coca Cola Bottling Co., 339 East 46th St., New York City, has awarded the contract for altering and building additions to its factory on Atlantic Ave. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn)—The Eye Brand Confectionery Co., 239 Alabama Ave., has awarded the contract for the construction of a 2 story, 50 x 100 ft. factory, on Georgia and Belmont Aves. Estimated cost, $45,000.

N. Y., New York (Borough of Brooklyn)—Humbert & Andrews, 646 Dean St., manufacturer of preserves, will build a 1 story factory on Vanderbilt Ave. and Bergen St., also one on Dean St. Total estimated cost, $195,000.

Pa., Ashley (Wilkes-Barre P. O.)—The Robert West Knitting Co., Manhattan St., is having plans prepared by C. R. Rinehimer, Archt., 10 Airy St., Wilkes-Barre, for the construction of a 1 story, 50 x 100 ft. silk mill. Estimated cost, $50,000.

Pa., Coatesville—Breuinger Bros. has awarded the contract for the construction of a 2 story, 80 x 126 ft. ice cream plant.

Pa., Forty Fort (Kingston P. O.)—The Victory Throwing Co. will soon award the contract for the construction of a 3 story, 50 x 125 ft. silk mill, on Butler St. Estimated cost, $50,000.

Pa., Gouldsboro—The Reiling Silk Co., Inc., is having plans prepared by L. Hancock, Jr., Archt., Mearo Bldg., Scranton, for the construction of a 1 story, 100 x 100 ft. silk mill, on Main St. Estimated cost, $50,000.

Pa., Lock Haven — The Pennsylvania Paper Co. plans to build a 3 story, 100 x 300 ft. paper mill, to have a daily capacity of 120 tons. Estimated cost, $3,000,000.

Pa., Philadelphia—The Light Mfg. Co., c/o R. E. White, Archt., Penn Bldg., is having plans prepared for the construction of a 2 story, 40 x 125 ft. factory, on 22nd and Cherry Sts., for the manufacture of leather goods. Estimated cost, $10,000.

Pa., Philadelphia — The Scott Powell Dairies, Inc., 890 North 48th St., have awarded the contract for the construction of a 2 story, 30 x 90 ft. addition to their plant. Estimated cost, $12,000.

Pa., Taylor—The Taylor Silk Co. is having plans prepared by E. H. Davis and G. M. D. Lewis, Archts., Union Natl. Bank Bldg., Scranton, for the construction of a 1 story, 65 x 130 ft. silk mill, on Taylor Rd. Estimated cost, $50,000.

Pa., Wilkes-Barre—The Bennett Estate has awarded the contract for the construction of a 3 story, 60 x 100 ft. garage and store, on North Main St. Estimated cost, $49,000.

Pa., Wilkes-Barre—The Saba Ice Cream Cone Co. is having preliminary plans prepared by C. R. Rinehimer, Archt., 10 Airy St., for the construction of a 2 story, 50 x 50 ft. cone factory, on Bank St. Estimated cost, $30,000.

Pa., Wilkes-Barre—The Suplan Silk Corp. will soon award the contract for the construction of a 3 story, 200 x 225 ft. silk mill on Pennsylvania Ave. Estimated cost, $500,000. G. S. Welch, Coal Exchange Bldg., Archt.

SOUTHERN STATES

Ga., Griffin—The Rushton Cotton Mills plan to build 1 story, 200 x 220 ft. weave shed. Estimated cost, $225,000. Lockwood, Greene & Co., Healey Bldg., Atlanta, Archt. and Engr.

Ken., Louisville—The Standard Oil Co., 424-30 West Bloom St., is having plans prepared for the construction of an addition to its refinery at Riverside Sta., which will double the present capacity of the plant. Estimated cost, $2,000,000.

La., Shreveport—R. E. Seaman plans to build a refinery, to have capacity of 5,000 bbls. Estimated cost, $600,000.

N. C., Winston-Salem—The P. H. Haynes Knitting Co. has awarded the contract for the construction of a 6 story, 80 x 200 ft. knitting mill and dye house. Estimated cost, $330,000.

Tenn., Chattanooga—The Thatcher Spinning Co., 2714 East 18th St., has awarded the contract for the construction of an addition to its spinning plant. Estimated cost, $1,200,000.

MIDDLE WEST

O., Columbus—The H. C. Godman Co., 31 North 4th St., manufacturer of shoes, has awarded the contract for the construction of a 3 story, 45 x 187 ft. factory, on Thurman Ave. Estimated cost, $100,000.

Wis., Cudahy—The Federal Rubber Co., Packard Ave., is having plans prepared by G. B. Allen, Engr. and Archt., 424 Jefferson St., Milwaukee, for the construction of three 6 story, 160 x 220 ft. factories.

Wis., Saukville—H. J. Cary is having plans prepared by W. F. Hilgen, Archt., Cedarburg, for the construction of a 1 and 2 story, 36 x 370 ft. cannery.

WEST OF THE MISSISSIPPI

Okla., Beggs—The Kre Ko Refining Co., Bristow, is having plans prepared by Foster & Gilmore, Arhts. and Engrs., Tulsa, for the construction of a 1 story refinery, 1 mile north of the town, to have capacity of 3,000 bbls. Estimated cost, $400,000. E. W. King, Pres.

Tex., Clinton—The Keen Wolf Refining Co., 317 Beatty Bldg., Houston, is having plans prepared by A. Peterson, Engr., c/o company, for the construction of a plant, to consist of several buildings, near here, to have a capacity of 1,000 bbls. Estimated cost, $300,000.

Tex., Quannah—The Four States Oil and Refining Co. plans to build a 1 story refinery. Estimated cost, $400,000.

Tex., Ranger—The International Oil and Refining Co., will build a refinery. Estimated cost, $300,000.

Tex., Ranger—The Olda Clark Refining Co. plans to build a refinery. Estimated cost, $250,000.

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